DECEMBER, 1955

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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How to Select AUTOMATIC FEEDING EQUIPMENT

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Indexing of TOOLING MANUALS

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BPA

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ELMIRA, N.Y.

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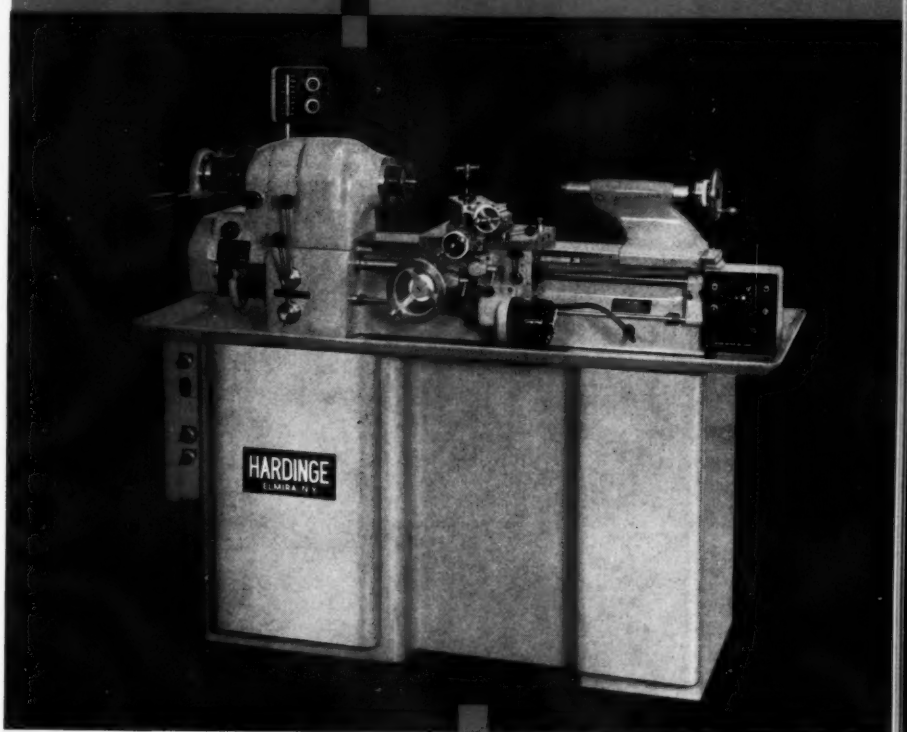

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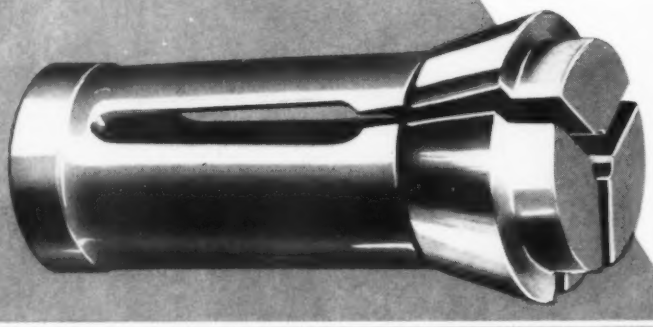

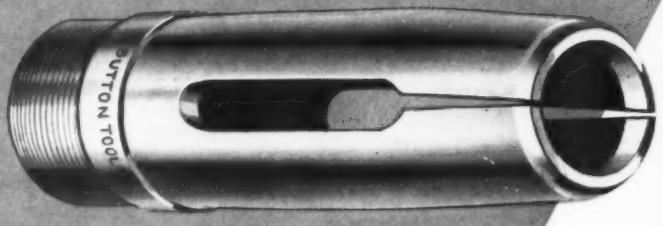

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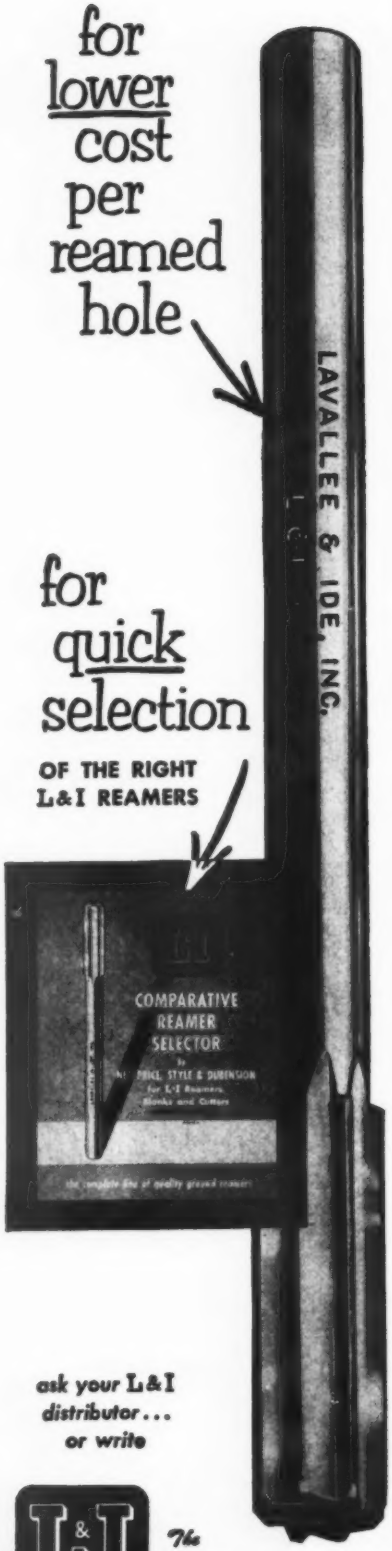

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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-1951

George J. Huebner, Founder

VOL. XXI—No. 9 DECEMBER, 1955

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Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

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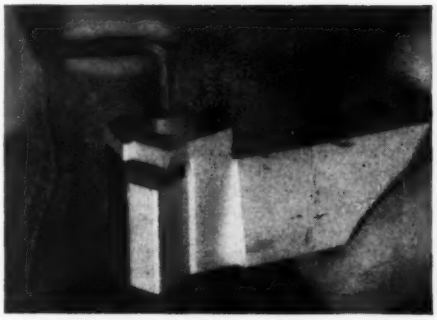
has the Patented "ELEVATOR"...



Only a matter of seconds to index the insert . . .

1. Loosen the main screw
2. Index the insert
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This automatically brings the cutting edge back to center . . . eliminates adjustment of tool shank.

Makes "Throw-Away" Blanks

- **EASIER TO USE**
- **CUTTING EDGE *ALWAYS* ON CENTER**
- **CUTS COSTS 35% TO 50%**

The exclusive V-R elevator provides an adjustable base for the insert . . . saves down time, makes indexing or changing inserts a quick, simple operation. Only the V-R patented elevator permits the use of any length of carbide, including "Throw-Away" blanks. Regardless of carbide length, the cutting edge is always on-center. The replaceable and reversible tool steel elevator is ground to provide a firmer base for the insert and, at the same time, locks the insert solidly in the toolholder. Ask your V-R representative to show you how the patented elevator of the V-R Toolholder can save you money, or write for details and the New V-R Toolholder catalog.

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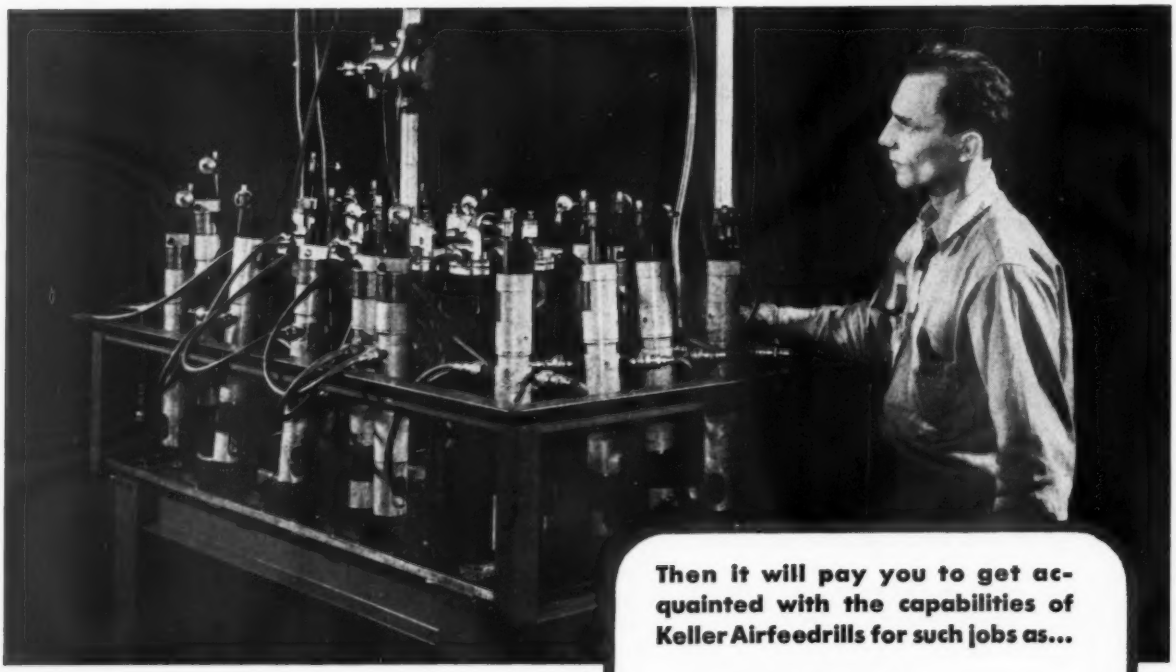

A typical automatic production setup using 14 Keller Airfeedrills. Pressing a single control valve drills 14 holes simultaneously in a refrigerator outer shell assembly—the drills advance, drill, retract, and shut off automatically.

Then it will pay you to get acquainted with the capabilities of Keller Airfeedrills for such jobs as...

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- **REAMING**
- **COUNTERSINKING**
- **TAPPING**
- **CENTER DRILLING**
- **CHAMFERING**
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- **SPOTFACING**

These remarkable tools work without supervision, and take the place of expensive machines in automation setups. They are entirely air controlled and operated, automatically cycled, and extremely accurate.

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KELLER TOOL

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- Master Pushers and Pads
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- Ejector Collets
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- Carbide-faced Stock Stops for B. & S. Machines

You get the most out of your machines and reduce stock waste when you use Benco Pushers because they are designed and processed to insure smoother, faster feeding on simple or difficult jobs!

Expertly manufactured from selected alloy steels, properly heat-treated, carefully inspected for accuracy and tension, Benco Pushers out-produce and out-last similar products. As a result, extraordinary production records over a wide range of feeds and speeds are easily achieved on machines equipped with Benco Pushers.

Let us recommend the proper Benco Pushers for your particular requirements. You get immediate delivery on most sizes from our large stock.

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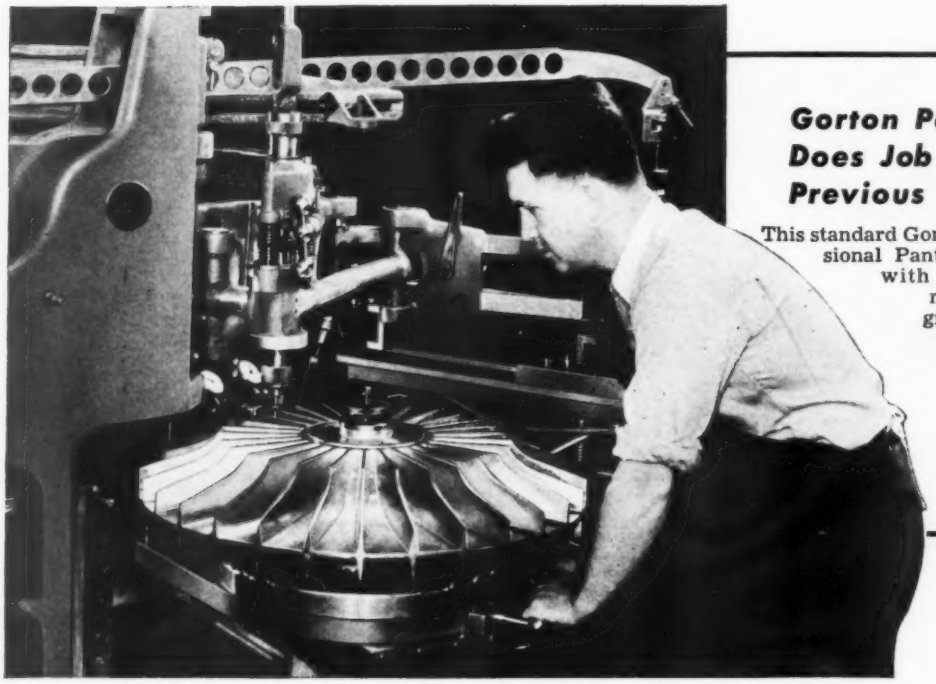

Gorton Pantograph Does Job in 1/5 Previous Time!

This standard Gorton P2-3 2-dimensional Pantograph, equipped with special tooling, mills 58 key lock grooves in a heat-treated aluminum alloy forging. In only 58 minutes it does a job that previously required five hours.

GORTON Pantography Means Creative Production

What's *your* problem in machining? Gorton Pantography may help you *create* a new or better production method if your problem falls into any of these categories:

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INSIDE PROFILING	COUNTERBORING
OUTSIDE PROFILING	CHAMFERING
ROUTING	GROOVING
DIE SINKING	GRADUATING
MOLD CUTTING	ENGRAVING

MATERIALS

FERROUS METALS — NON-FERROUS METALS — PLASTICS

SHAPES

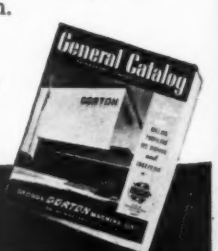
FLAT	UNIFORMLY CURVED
CYLINDRICAL	SQUARE
SPHERICAL	IRREGULAR

Gorton 3-dimensional Pantography operates vertically and horizontally in combination. It uses enlarged masters, templates or patterns—easily and inexpensively made. Normal operation applies the reduction ratio principle for increased work-piece accuracy —an exclusive Pantograph benefit.

Whether a dozen or a thousand pieces, each is identical in shape and tolerances to the first. Operation during cutting cycle is manual or automatic, and work pieces vary from dime size to areas as large as ten feet.

If you have a production problem, describe it in a letter and let Gorton engineers demonstrate the service that has helped many other manufacturers. No obligation.

Write for complete Catalog 1655-1212



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Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

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It Packages 3 GREAT ADVANTAGES for you—*AND MORE*

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COOL
CLEAN

You get more cuts and cleaner cuts. Triple C is non-gumming, non-galling, anti-rust. Friction is reduced. . . . Extreme pressure lubricity gives you longer tool life.

Triple C Cutting Coolant is water-soluble, non-oily and non-greasy. It is not subject to the development of any foul odor. Work pieces are not slippery; are easy to handle.

Your men will like Triple C Cutting Coolant, because it eliminates all fire hazards; is smokeless and foamless. Its vapor is harmless to the operator. There is no danger of skin infection. Work-pieces are clearly visible.

Triple C Cutting Coolant—the long awaited answer which sidelines serious obstacles to today's steadily increasing feeds and speeds. Tested and proven amazingly effective in nation-wide operation, Triple C actually revolutionizes technology in this field. Every molecule is a complete unit that contains all the elements requisite to ideal cooling and lubrication. Triple C solutions never break or separate. Lengthen your tool life! Step up production! Maintain accuracy and safety to your operators! *Triple C Cutting Coolant does all three!*

• *Your Motch & Merryweather dealer carries Triple C Cutting Coolant in stock.*

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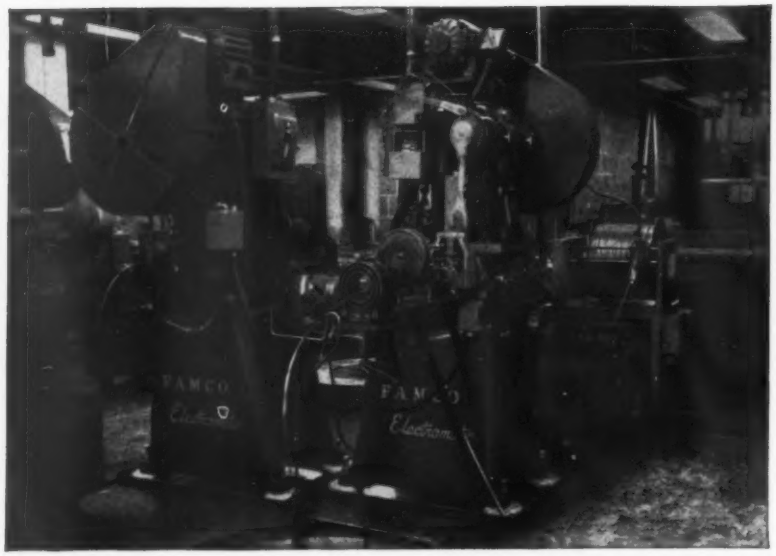

The busy-bodies of power presses—two of 10 Famco 18 Ton Presses busy perforating high carbon steel for a new type 98 chrome oil ring at Perfect Circle's Hagerstown, Indiana plant.

THESE FAMCO POWER PRESSES *are running by themselves!*

It may seem odd to see a power press working with nary an operator in sight. Odd but effective. And profitable. As a result of the continuous stroke action of Famco's ELECTROMATIC CLUTCH, only *three* men are needed to run the *entire* battery of ten Famco Power Presses at the Hagerstown, Indiana plant of Perfect Circle Corporation. Presses are run 24 hours a day, 6 days a week . . . and, process 8,000 feet of high carbon steel ribbon per hour!

These Famco Power Presses are used to manufacture the ring spacer-expander for Perfect Circle's new type 98 chrome oil ring. A large die holds a series of three smaller dies arranged to perforate, form and restrike ribbon steel into the spacer-expander section at the rate of one inch for each stroke of the ram. Ram travel (crankshaft throw) is one-half inch.

But volume production with minimum labor is only one of the features of these busy-bodies of the power press world. The 9-point, electrically operated jaw clutch can be changed from single stroke to continuous action *while the press is running!* All Famco Presses have heavy, one-piece frames cast of semi-steel with extra heavy ribbing for added strength. Solid one-piece crankshafts are high carbon precision ground to assure perfect alignment. And there are many more exclusive features.

To really recognize the superiority of a Famco Power Press you have to see it in action. Then you'll realize the power it delivers with ease. Why it's called a busy-body. 50 models to choose from—the most in the small press field.

Write today for detailed catalog . . . no obligation.

famco machine company

3124 SHERIDAN ROAD • KENOSHA 125, WISCONSIN

Air Presses • Arbor Presses • Band Saws • Drill Presses • Foot Presses
Power Presses • Squaring Shears

Please send me copy of the Famco Power Press Catalog.

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

PLASTICS IN BODY TOOLING

by Lewis F. Bogart

TOOL CHEMICAL COMPANY*
Detroit, Michigan

THE USE OF PLASTICS in body engineering and tooling has rapidly increased. Today it is estimated that 40% of gage and fixture work in the automotive field involves plastics. Plastics metal forming tools have become extensively used, and the reproduction in plastics of models and parts has become indispensable by providing the tool vendors with established trim lines and reliable contours before their tooling is started.

Once the master die model has been fabricated of wood or resin impregnated materials, it has become common practice to make a spotting rack for die finishing by building up or laminating glass cloth and epoxy resin over the model which has been sprayed with a parting agent. This spotting rack is framed with metal or plastic tubing and used in turn to laminate a duplicate of the original model. This model of laminated glass is framed and can be cubed in the manner of the original wood models.

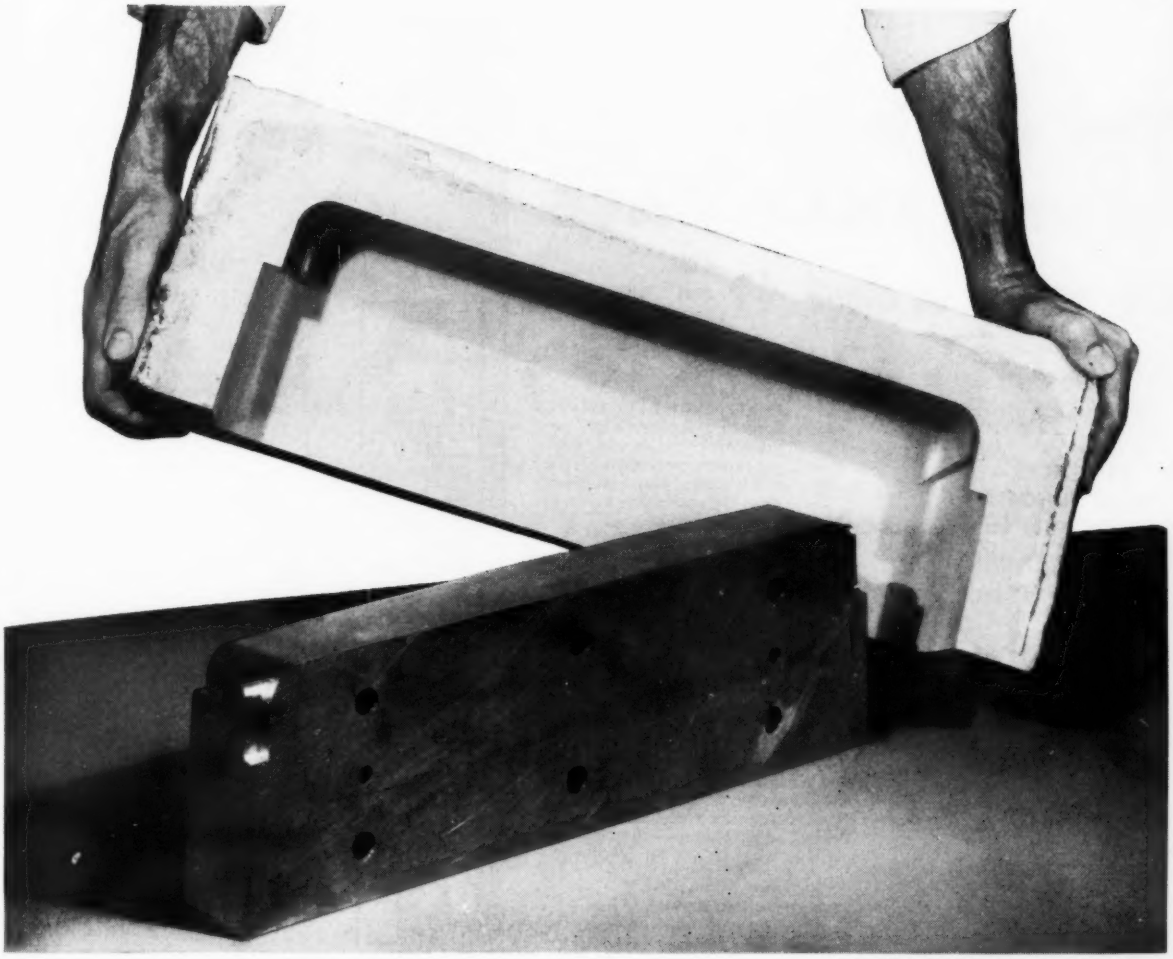
This laminated model is very durable and stable which allows it to be used for many applications. It can be used as a keller or duplicating model. It can be used for reference work in checking the contour of stampings, and it can be used to make laminated gages and fixtures and, once they are made, to check them.

The rapid fabrication, durability and light weight of these tools make

This address was delivered by Mr. Bogart before the 10th Annual Convention of the American Society of Body Engineers, Detroit, Michigan, October 1955.

*Representing The Marblette Corporation, Long Island City, N. Y.

. . . *Continued on page 26*



"Rezolin" Toolplastik Compound forms the concave die model shown here with the machined aluminum model around which it was cast. A "Keller" duplicator will be used to reproduce the plastic model in steel. This method saves five days, with an estimated 25 per cent reduction in production costs. Based on BAKELITE Epoxy Resins, this tooling compound is produced by **Rezolin, Inc., Los Angeles 25, Calif.**

Cast epoxy "Keller" Model shapes up 25% saving

Savings in toolmaking time often reach impressive percentages when compounds based on BAKELITE Brand Epoxy Resins are used. Here are some of the reasons:

- **Liquid compounds—can be cast to shape without pressure**
- **Cured at room temperature—no applied heat**
- **Minimum shrinkage—minimum finishing**
- **Excellent flexural, compression, and impact strength**
- **Outstanding dimensional stability**
- **Light weight means easy handling**
- **Laminated with glass cloth to form jigs, spotting racks, fixtures, and "Keller" models.**

For further information, write Dept. LO-182

BAKELITE
BRAND
Epoxy Resins for Tooling

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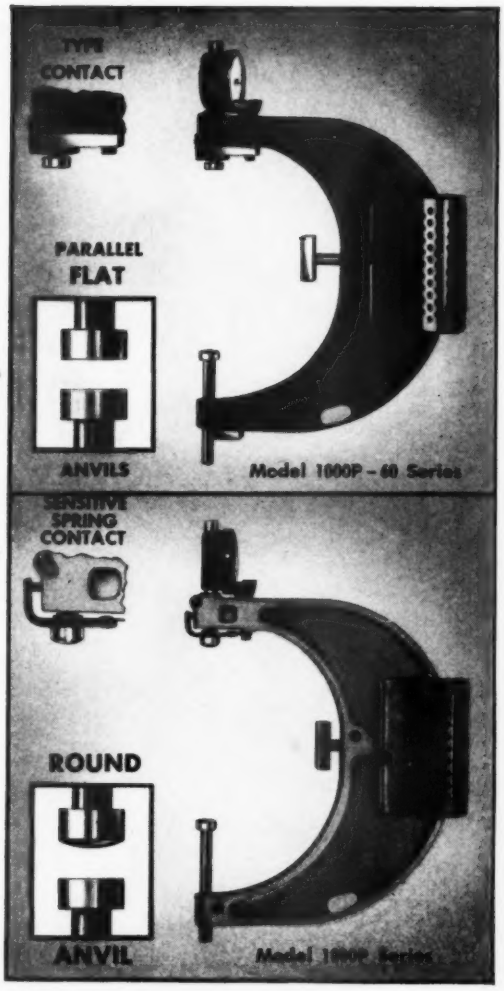
Either TUNGSTEN CARBIDE for enduring accuracy or STEEL for price.

FLAT, PLUNGER ANVILS where anvils must gage close into corners of shoulders and yet remain perfectly parallel at all times. Gage is adjustable yet maintains accuracy, graduated in tenths.

ROUND, SPRING ANVILS for more general requirements. Sensitive contact: spherical. Lower: flat and adjustable. Inexpensive, fast and accurate, graduated in tenths.



SMALL FLAT ANVILS either single dimension or adjustable. Gages close to shoulders – anvils remain parallel. Light, sensitive, positive. Nearest style to "fixed" snap gages.

RETRACTING ANVIL for super finishes and soft material. Sensitive, flat lapped anvils remain parallel throughout adjustment.

RUGGED PLUNGER TYPE for heavy duty. Upper anvil has spring tension sufficient to counteract weight of gage and operator's hand.

RUGGED SPRING TYPE lower anvil is sensitive so that weight of gage and operator's hand rests on the fixed contact.

We make Indicating Snap Gages to suit any whim or necessity

These Gages are made to meet all the usual physical and accuracy needs of gage users. They can be had in a wide range of sizes and can be modified to suit particular needs. If you haven't seen just what you *must* have, ask us about what you want. We also make Air Snap Gages.

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OF LARGE AND SMALL SETS

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Large Sets No Longer Need Be Blocked . . . Small Sets Can Be Lifted Without Sliding.

Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment. Write for FREE 24 page Catalog on Superior Die Sets and Supplies.

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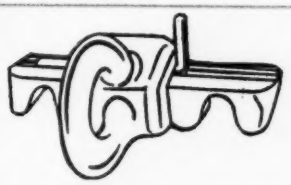
SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

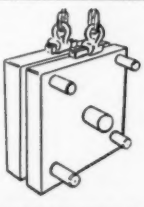
SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. There is no extra charge for this valuable safety feature.



LOCK-JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.



E-Z LIFT SLING CHAIN

is especially designed to fit the flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs.

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No. 4 in a series

STEP UP WITH CONE

You send print to Cone

Cone makes recommendations

Cone submits samples of your work

You get demonstration of your work and complete job development record

No "automatic" user can afford to be out of touch with the latest developments in the use of carbide tools.

The popularity of the Conomatic Carbide Development program has made necessary larger quarters for increased clientele accommodation.

This innovational Cone service is without obligation of machine purchase and is available to users of any brand of multiple spindle automatic.

It costs nothing to know just how profitable your work might be with modern machines, tools, and know-how.

DATA FOR COMPARISON

Part.....Spec. Cap Screw	Length.....4 17/32" Cutoff 2" Thread
Machine.....1⅝" Conomatic	
Tools.....100% Carbide Tipped	RPM.....885 Work Spdl. 580 Th'd Spdl. 1465 Total Eff'd.
Material.....8742	
Stock Size.....1" Across Flats	Time.....14 Secs.

Conomatic

Send for particulars on "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 14

MOORE SPECIAL TOOL COMPANY

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

7 Tricks of the Trade in Jig Grinding Small Holes

The following tricks of the trade will prove helpful in jig grinding small holes with a diamond-charged mandrel:

1. Uniformly graded diamond powder should be used for charging mandrels. Holes from minimum (1/64") to about 3/32" in diameter should be roughed and finished with 80-100 grit powder. Larger holes may be roughed somewhat more rapidly with a coarser grade, 60-80 grit.

2. Avoid bellmouth by preventing the mandrel from leaving the hole at either end.

3. Since a freshly charged mandrel will cut much more rapidly than a worn one, avoid introducing a freshly charged tool as a hole nears size, Fig. 1.

4. Do not permit the uncharged *shank* of a mandrel to contact the surface being ground. Frictional heat will burn both the work and the mandrel. The former, partially annealed at point of such contact, will charge with diamond sut and probably be ruined.

5. It is generally more economical and efficient to consider mandrels as expendable and make a new one for each job. Since the cost is only a few cents, use of an old one, or even the time spent trying to match one to requirements, is hardly justified.

6. Because mandrels cannot be trued with a diamond, it is necessary to measure both the top and bottom of a hole while grinding, in order to avoid a ridge.

7. In view of point 6, it is advisable to set the work up on parallels of sufficient height to enable measurement from beneath the workpiece, Fig. 2.

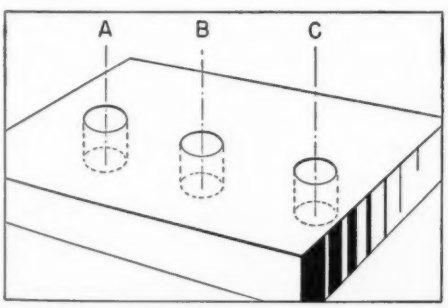


Fig. 1. In grinding three holes to size, A and B are roughed to within .001"—.002", and C within about .005". Using a freshly charged mandrel, C is finished to size, thereby breaking down the high points on the tool. A and B may now be safely ground to size.

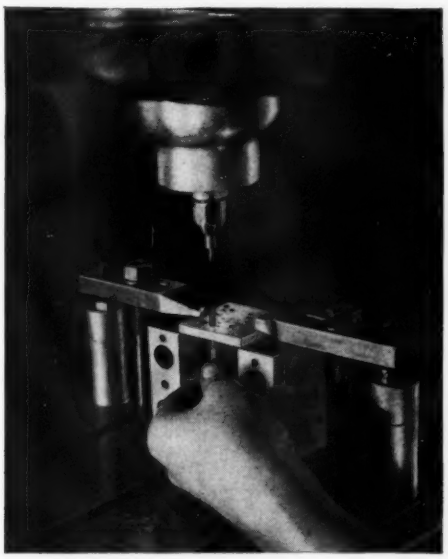
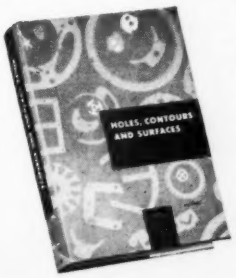
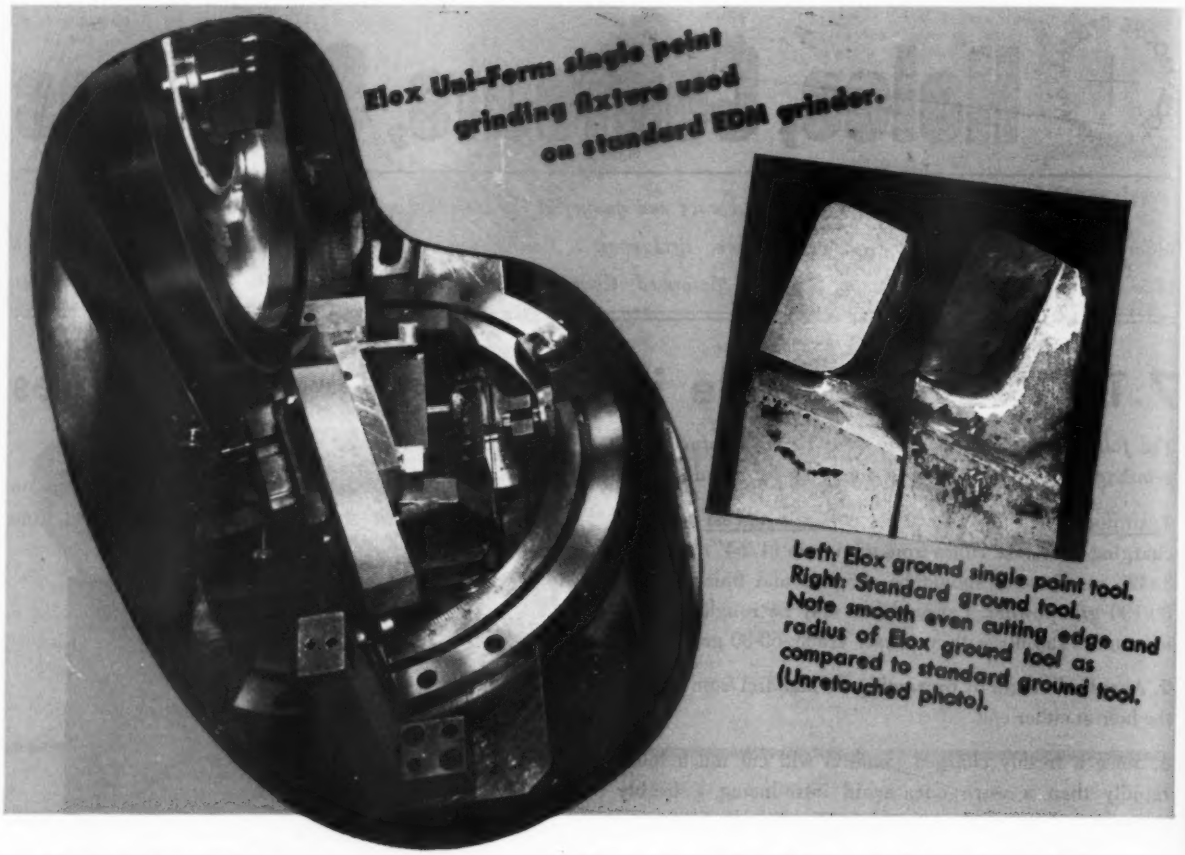


Fig. 2. Workpiece is mounted high enough to permit measuring bottom as well as top of hole.

Get ALL the answers from this new, 424-page book

The information on this page is just a sample of the valuable, on-the-job aid you can get from Moore's *all-new* book, HOLES, CONTOURS AND SURFACES. Tells you how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Price only $5 in U.S.A., $6 elsewhere. Send check or money order to Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn.




Elox Uni-Form single point
grinding fixture used
on standard EDM grinder.
Left: Elox ground single point tool.
Right: Standard ground tool.
Note smooth even cutting edge and
radius of Elox ground tool as
compared to standard ground tool.
(Unretouched photo).

grind 2 faces and radius on 1/2" x 1" carbide insert in 3-1/2 minutes automatically . . . repetitively . . . without variation . . . without heat checks . . . without manual assistance!

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Elox Electrical Discharge Machining of single point tools is an electronically controlled push button operation. Variable human elements are completely eliminated, guaranteeing every tool sharpened identical as to finish, radius. Grinding is done with a brass wheel to any pre-determined specifications. Every tool repetitively uniform!

Advantages of Elox Uni-Form Tool Grinding:

- **Permits use of standard blanks**
- **Every tool is identical as to radius, finish**
- **Increased tool life**
- **More regrinds per tool**
- **Eliminates diamond wheels**
- **Carbide and tool shank are ground simultaneously**
- **Averages 40% labor savings**

See Elox Uni-Form Single Point Tool Fixture in operation at Elox Demonstration Centers.

*T.M. Reg.

CIRCLE INFORM-A-GRAM KEY NO. 16

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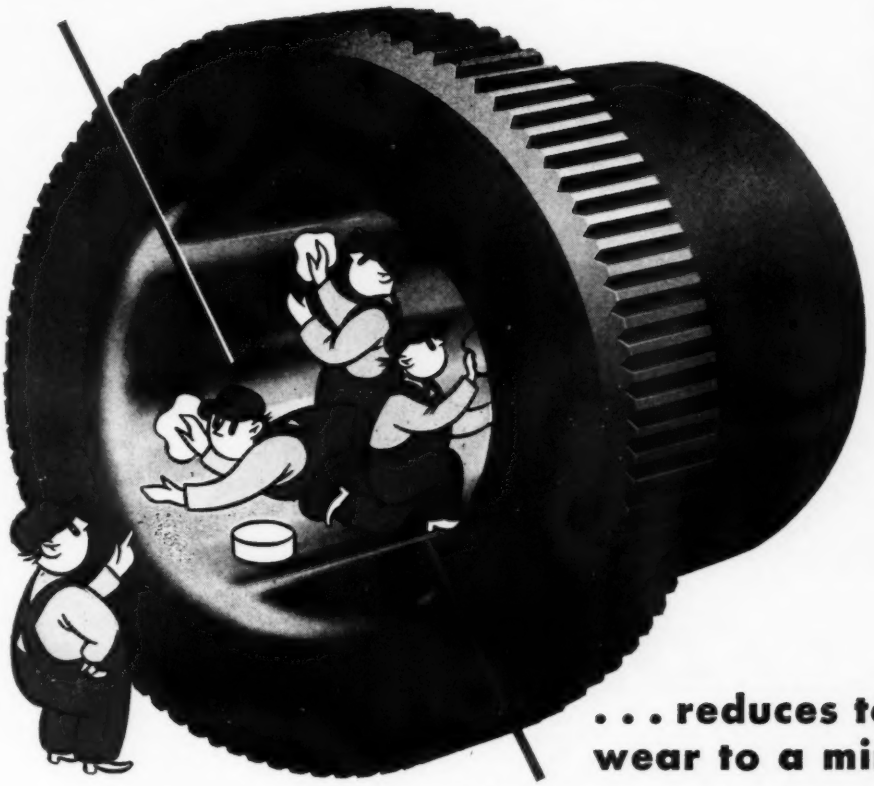

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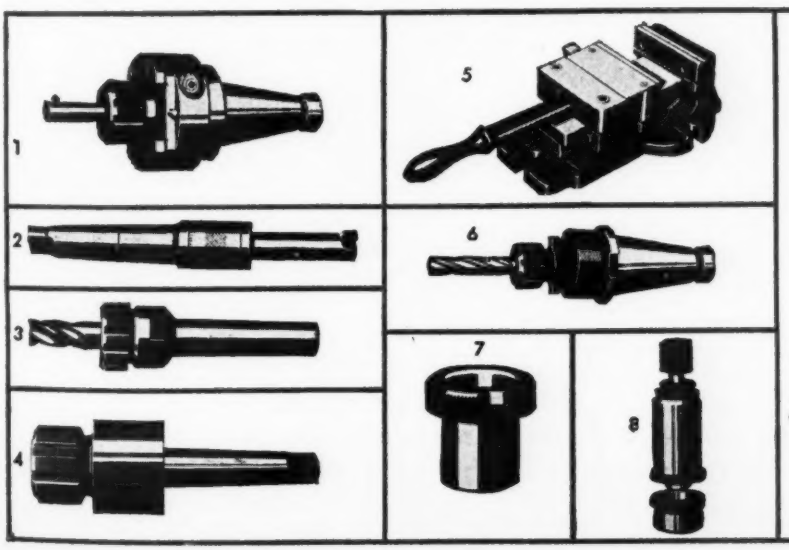
One sure way to cut excessive tool wear in your operations is to specify Universal Drill Bushings because their superfinish bores help reduce wear on production tools to an absolute minimum, especially in close tolerance work. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy, uniform high quality and long life. Knurled heads provide a quick, sure grip. Universal Drill Bushings are produced in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N.J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

170



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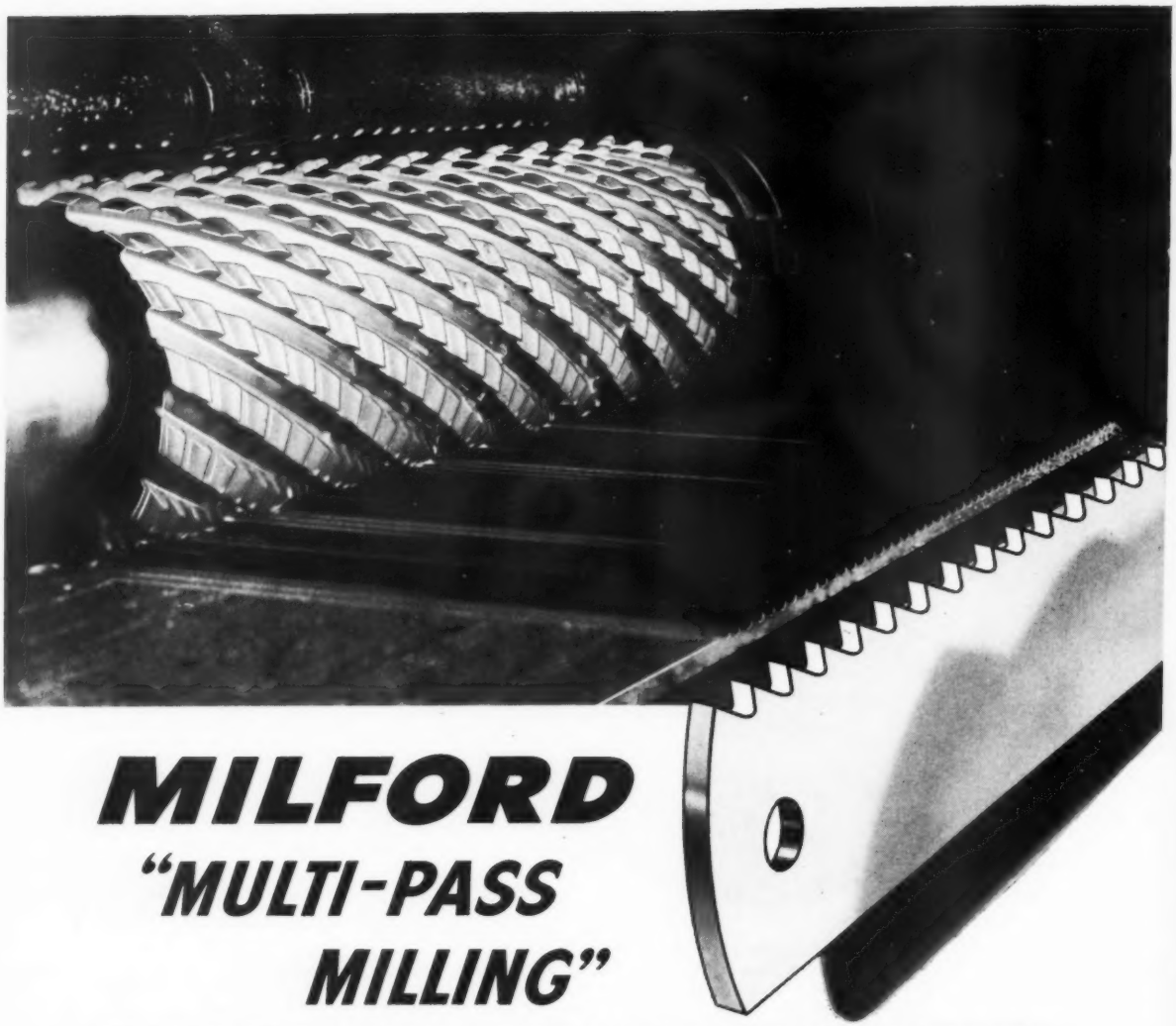
CIRCLE INFORM-A-GRAM KEY NO. 17



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"Multi-Pass Milling," many passes of the milling cutter with a final "burnishing" pass, produces smooth gullets, essential to clearing chips dependably — and smooth sharp cutting edges that are outstanding features of MILFORD Hack Saw Blades. High internal stresses and burrs set up by ordinary milling methods are eliminated.

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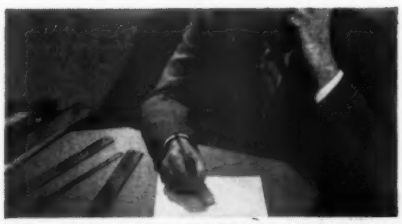

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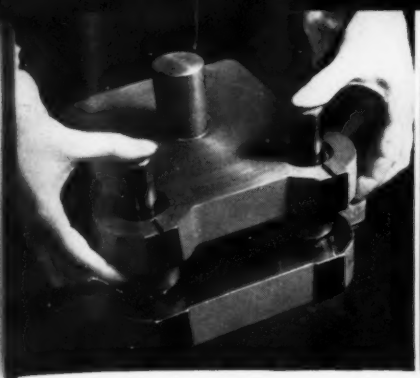

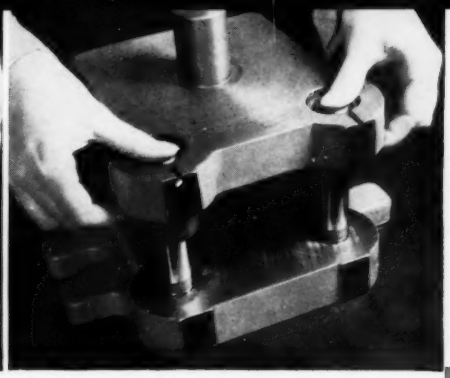

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Hailed as the greatest achievement in modern OBI press design and performance, by over 100,000 spectators who examined this mechanical marvel at the Machine Tool Show, the all-new Niagara Series E, Single Point, Open Back Inclinable Press starts a brand new chapter in press history.

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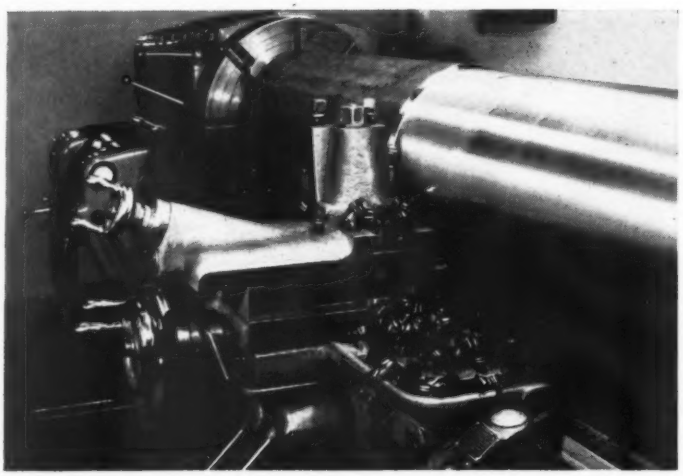

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TXH is new, brand new, not just another grade designation for an altered existing grade. It is a completely new concept . . . a combination of materials and processes designed specifically to do heavy duty, high production cutting operations better than they have ever been done before. It does.

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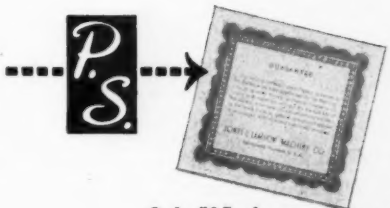

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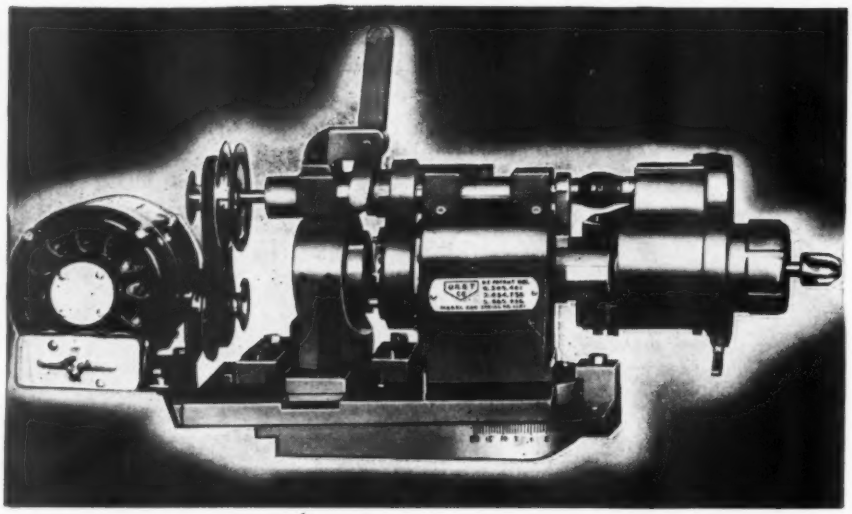
CIRCLE INFORM-A-GRAM KEY NO. 23

Precision CIRCULARITY GRINDING ATTACHMENT



Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of spiral cutting tools is to be ground for both form and radial relief, the Circularity Grinding Attachment travel is similar to an O.D. grinder, which insures fine finish, back taper and accurate size.

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The Detroit Reamer & Tool Co. Plant is equipped with the finest in modern machinery and inspection facilities to provide you with the ultimate in precision tools. Our Engineering and production personnel with 35 years of empirical knowledge behind them are completely qualified to expertly handle your tool needs. For dependable cutting tools—specify Detroit Reamer & Tool Co.

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CIRCLE INFORM-A-GRAM KEY NO. 24

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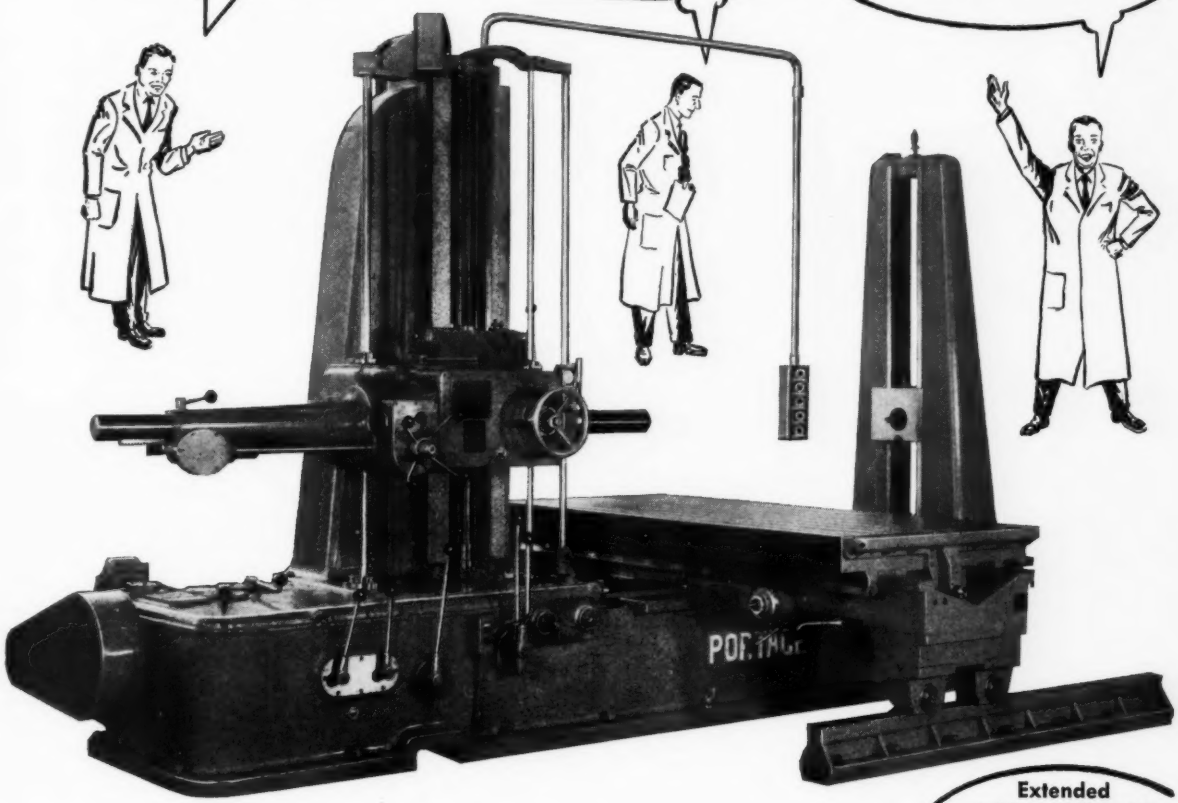
4" spindle diameter, precision machined nitralloy steel.

Pendent controls include spindle rotation, forward, reverse, jog forward, jog reverse and stop.

36 spindle speeds 8-1000 R.P.M. 18 Feeds.



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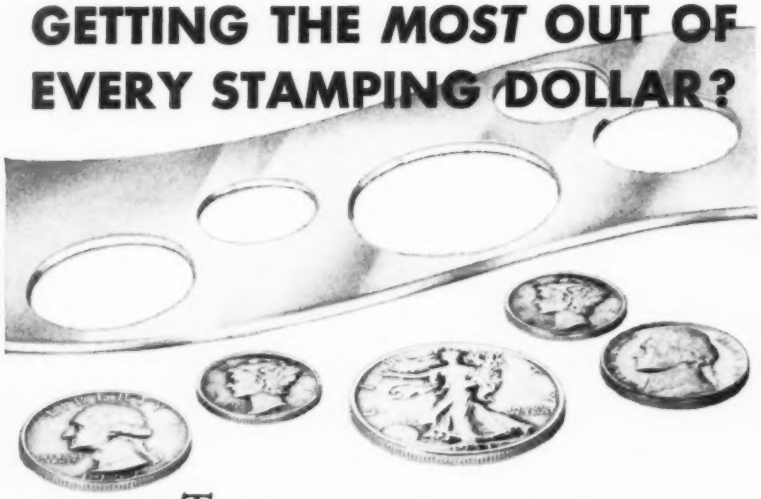
ARE YOU SURE YOU'RE GETTING THE *MOST* OUT OF EVERY STAMPING DOLLAR?



THERE'S a way you can be sure, if you'll apply a few simple questions to your own operation. Are you getting the best quality, delivery, accuracy you can expect? Are your tools lasting long enough? Is tool storage overhead eating up the profits? Are you faced with too much idle press time?

These things can mean you'd be better off by buying your stampings from a high quality outside source like Laystrom. You get better stampings from Laystrom, faster, and with less headaches. Our technical men work with stampings all the time. It's our specialty. Our years of experience assure you that your stamping problems will be solved in the most economical way. We take advantage of all possible opportunities to do every job with the fewest possible steps, creating savings in labor and material *which are passed on to you in the form of lower unit costs.*

On your next job, let us know your requirements and figure on them. You may be surprised at the savings and benefits we can offer you. Send your drawings today!

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TOOLS • DIES • ASSEMBLIES • PARTS DESIGN • SHORT-RUN DUPLICATING
Manufacturers of the Layco Tru-Align Die Setup

. . . Month's Talk, from page 10

them a reliable method of controlling dimensions throughout a program from prototype to production run.

Some firms employ different techniques to lower costs and time requirements of this type of tooling. One firm will cut in mahogany a cavity roughly shaped to the master model, place it on the master model, and seal up the sides. Then a liquid plastic will be poured in this cavity between the model which is coated with a parting agent and the base. The plastic will vary from ⅛" to ¾" on the base.

Another firm uses rough aluminum castings for their bases and casts on a face of plastic. They often laminate a face against the model and then cast plastic between the face and aluminum casting, cementing them together.

Production tools with irregular contours can often be economically made with plastic laminates and plastic castings. Where a face is subject to wear, metal inserts can easily be incorporated. Some common applications of plastics tools are: contour checking gages, drilling fixtures, hole checking gages, assembly fixtures, buffing fixtures, paint spray masks and many, many others.

The field of metal forming with plastics is constantly growing and changing. Much has been learned and much material development has been accomplished. We have only just begun, but some jobs can be done in plastics with confidence, and with great savings in time and costs.

Chrysler uses large amounts of phenolic for the rubber forming, stretch forming, and hand hammer forming of sheet metal panels for prototype automobiles. Molds for these tools are fabricated rapidly by laminating a layer of cloth on a master model or on clay and backing it with sisal hemp impregnated plaster. These molds are coated with a parting agent and then a low cost phenolic mixed with a hardener is poured in. After setting overnight the tool is removed from the mold and put to work forming sheet metal body panels in an 8000 ton rubber press.

If a stretch form tool or hand hammer form tool is required, the tool is cheapened by rough cutting previously foamed phenolic to the general shape of the mold, less one to two inches. This space then is filled with cast phenolic. For more than a few panels a metal edge strip may be used to maintain sharp corners. These phenolic tools are relatively accurate for a period of time and Chrysler is through with them before they become inaccurate.

Fisher Body, however, required a material stable for long periods. The phenolic over-cured would be stable; but this is an inconvenience, and

CIRCLE INFORM-A-GRAM KEY NO. 26

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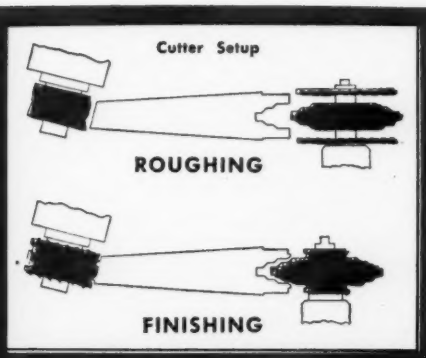

Production rates are dependent upon workpiece size. For example, twenty-seven 13½" chrome-nickel-steel blades are rough-and-finish milled per hour by this new Kearney & Trecker Two-Spindle Bed Type machine.

Rectangular index table with two work-holding fixtures enables the operator to unload and load one fixture while the other is in work. This sequence eliminates down-time and keeps production constant.

Dovetail end of blade is rough-and-finish milled with the lower spindle, using a combination of special form and side mills. Head, mounted in an inverted position on a saddle, is counterweighted. Tenon end of blade is milled with the upper vertical head which moves in an arc on radial ways . . . angular adjustment of 45° is possible.

Other machine features include air-clamping for machine table . . . automatic chip conveyor . . . high volume coolant pump . . . easy to change pick-off gears for each head to select exact desired spindle speeds.

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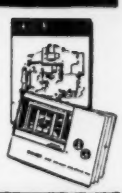
Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

For more details on machine illustrated ask for Data Sheet No. 1067. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.



KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

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they have turned to a low cost (60c per pound) self-curing epoxy core mix. This core mix has higher physical properties than the phenolic and has very low shrinkage, so low it can be ignored. This resin is handled in the same manner as the phenolic casting resin and can be used with a low cost foam core for stretch dies, etc. This material also can be heat cured at 200° overnight which would yield a composite strength of 20,000 psi.

For the application of draw and forming dies, many materials have been tried and discarded. Glennie Industries of Romulus, Mich., has gone through a very thorough development program. Research goes on but the best materials today are able to form metal up to .090" C.R.S. and draw .060" C.R.S. for a few pieces to prove die design and blank development. Body sheet metal can be formed and drawn easily for quite a number of panels.

An abrasive-resistant resin was developed which was used for surface casting on a plastic or metal core. It was found to be excellent in wearability, better than anything previously tried, but shear and impact strength for corners was not high enough for heavy-gauge work. By thinning this resin and laminating it ¼" to ½" inside a mold from a die model and filling the cavity with the low cost core epoxy, good detail and configuration resulted on the steel panels.

For heavy-gauge work a core resin with high compressive strength is now under test. This material requires a short heat cure and should provide a method of casting dies without a laminate face for short runs of .030" to .040" steel. To date these plastics dies have been used by Ford Motor to determine whether some exotic shape dreamed up by a designer can be made and how.

The plastic die can be altered four or five times in a week, and when good panels are made the final die contours will be used for the production die. Ford estimates a saving of $250,000 resulting from needless operations that have been eliminated in proving proper die design for the part. Another company can make a tail light stamping in 5 operations instead of the 9 previously used. Short run production stampings can be made on dies of these materials probably with less service than would be required to spot in a metal tool.

Plastics have proved to be reliable materials when produced by reliable firms and handled by experienced people. Many of the limitations of materials have been eliminated and today tools of plastics can be used with confidence.

The American Society of Tool Engineers cooperating with Society of Plastics Industries, using grants from our firm and others, is establishing

. . . Continued on page 32

Dumore Hand Grinders precise spindle alignment makes them ideal for close tolerance tool and die production finishing.

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for detailed information on Dumore Hand Grinders and Flexible Shaft Tools.

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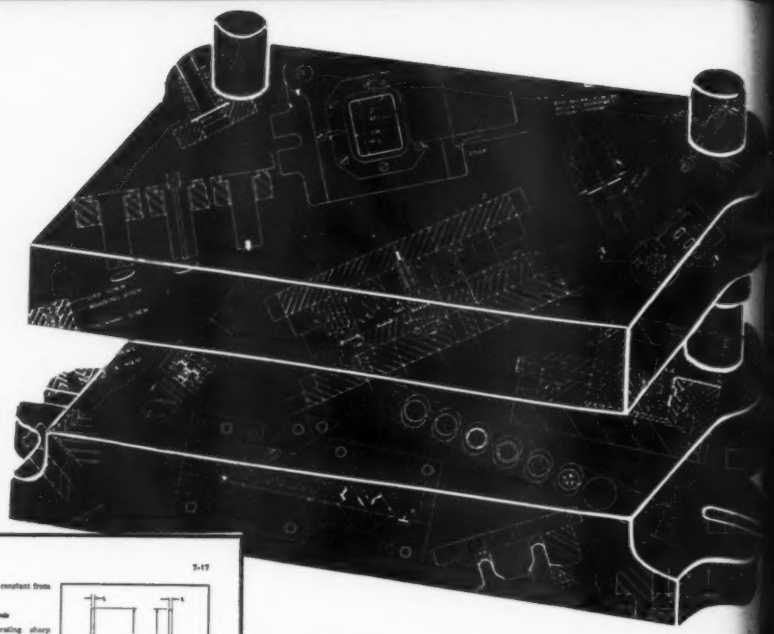

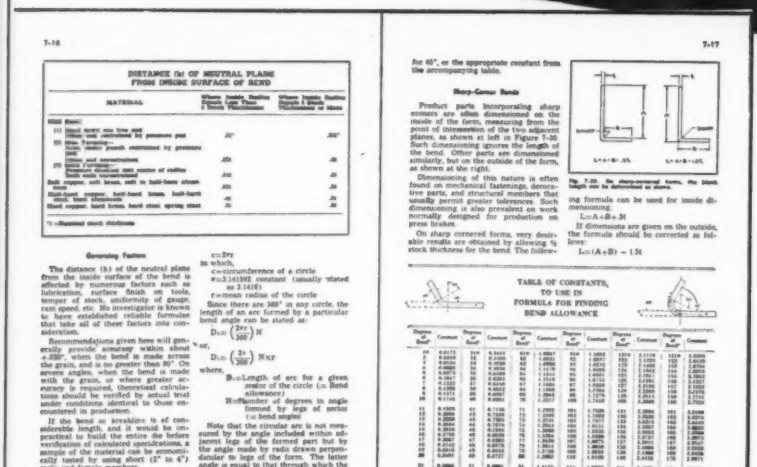

7-16

DISTANCE (h) OF NEUTRAL PLANE FROM INSIDE SURFACE OF BEND

MATERIAL	Where Inside Radius Equals Less Than 2 Stock Thickness	Where Inside Radius Equals 2 Stock Thicknesses or More
Steel (hard): (1) Hard spring and low and medium carbon cold rolled steel	.5T	.5T
(2) Alloy: Parkerized, bonderized or similar finish; punch restrained by pressure pad	.5T	.5T
Unless used unrestrained	.5T	.5T
(3) Cold Forming: Cold rolled steel, center of radius	.5T	.5T
Steel, unrestrained	.5T	.5T
Soft copper, soft brass, soft to half-hard aluminum	.5T	.5T
Half-hard copper, half-hard brass, half-hard steel, hard aluminum	.5T	.5T
Hard copper, hard brass, hard steel, spring steel	.5T	.5T

*t =Nominal stock thickness

Governing Factors

The distance (h) of the neutral plane from the inside surface of the bend is affected by numerous factors such as lubrication, surface finish on tools, temper of stock, uniformity of gauge, ram speed, etc. No investigator is known to have established reliable formulae that take all of these factors into consideration.

Recommendations given here will generally provide accuracy within about ±.020", when the bend is made across the grain, and is no greater than 90°. On severe angles, when the bend is made with the grain, or where greater accuracy is required, theoretical calculations should be verified by actual trial under conditions identical to those encountered in production.

If the bend or breakline is of considerable length, and it would be impractical to build the entire die before verification of calculated specifications, a sample of the material can be economically tested by using short (2" to 4") male and female members.

Basic Geometry

Formulas used in finding the bend allowance (D), or length of the arc assumed by the neutral plane, are based on the following geometry:

c=Dπ

in which,

c=circumference of a circle

π=3.141592 constant (usually stated as 3.1416)

r=mean radius of the circle

Since there are 360° in any circle, the length of an arc formed by a particular bend angle can be stated as:

$$D=\left(\frac{2\pi r}{360}\right)N$$

or,

$$D=\left(\frac{\pi}{360}\right)N\times r$$

where,

D=Length of arc for a given sector of the circle (= Bend allowance)

N=Number of degrees in angle formed by legs of sector (= bend angle)

Note that the circular arc is not measured by the angle included within adjacent legs of the formed part but by the angle made by radii drawn perpendicular to legs of the form. The latter angle is equal to that through which the metal is bent from the flat.

Since each shop will use a few certain angles for most of their work, with 90° bends being universally common, constants can be substituted in the preceding formula:

D=constant ×r

using 1.5708 as the constant for 90°, 0.7854

7-17

for 45°, or the appropriate constant from the accompanying table.

Sharp-Corner Bends

Product parts incorporating sharp corners are often dimensioned on the inside of the form, measuring from the point of intersection of the two adjacent planes, as shown at left in Figure 7-20. Such dimensioning ignores the length of the bend. Other parts are dimensioned similarly, but on the outside of the form, as shown at the right.

Dimensioning of this nature is often found on mechanical fastenings, decorative parts, and structural members that usually permit greater tolerances. Such dimensioning is also prevalent on work normally designed for production on press brakes.

On sharp cornered forms, very desirable results are obtained by allowing ¼ stock thickness for the bend. The following formula can be used for inside dimensioning:

L=A+B+.5t

If dimensions are given on the outside, the formula should be corrected as follows:

L=(A+B) − 1.5t

Fig. 7-20. On sharp-cornered forms, the blank length can be determined as above.

TABLE OF CONSTANTS, TO USE IN FORMULA FOR FINDING BEND ALLOWANCE

Degrees in Bend	Constant	Degrees in Bend	Constant	Degrees in Bend	Constant	Degrees in Bend	Constant	Degrees in Bend	Constant
1°	0.0175	31°	0.5411	61°	1.0647	91°	1.5882	121°	2.1118
2	0.0349	32	0.5585	62	1.0821	92	1.6057	122	2.1293
3	0.0524	33	0.5760	63	1.0996	93	1.6232	123	2.1468
4	0.0698	34	0.5934	64	1.1170	94	1.6406	124	2.1642
5	0.0873	35	0.6109	65	1.1345	95	1.6581	125	2.1817
6	0.1047	36	0.6283	66	1.1519	96	1.6755	126	2.1991
7	0.1222	37	0.6458	67	1.1694	97	1.6930	127	2.2166
8	0.1396	38	0.6632	68	1.1868	98	1.7104	128	2.2340
9	0.1571	39	0.6807	69	1.2043	99	1.7279	129	2.2515
10	0.1745	40	0.6981	70	1.2217	100	1.7453	130	2.2689
11	0.1920	41	0.7156	71	1.2392	101	1.7628	131	2.2864
12	0.2094	42	0.7330	72	1.2566	102	1.7802	132	2.3038
13	0.2269	43	0.7505	73	1.2741	103	1.7977	133	2.3213
14	0.2443	44	0.7679	74	1.2915	104	1.8151	134	2.3387
15	0.2618	45	0.7854	75	1.3090	105	1.8326	135	2.3562
16	0.2793	46	0.8029	76	1.3265	106	1.8501	136	2.3736
17	0.2967	47	0.8203	77	1.3439	107	1.8675	137	2.3911
18	0.3142	48	0.8378	78	1.3614	108	1.8850	138	2.4085
19	0.3316	49	0.8552	79	1.3788	109	1.9024	139	2.4260
20	0.3491	50	0.8727	80	1.3963	110	1.9199	140	2.4435
21	0.3665	51	0.8901	81	1.4137	111	1.9373	141	2.4609
22	0.3840	52	0.9076	82	1.4312	112	1.9548	142	2.4784
23	0.4014	53	0.9250	83	1.4486	113	1.9722	143	2.4958
24	0.4189	54	0.9425	84	1.4661	114	1.9897	144	2.5133
25	0.4363	55	0.9599	85	1.4835	115	2.0071	145	2.5307
26	0.4538	56	0.9774	86	1.5010	116	2.0246	146	2.5482
27	0.4712	57	0.9948	87	1.5184	117	2.0420	147	2.5656
28	0.4887	58	1.0123	88	1.5359	118	2.0595	148	2.5831
29	0.5061	59	1.0297	89	1.5533	119	2.0769	149	2.6005
30	0.5236	60	1.0472	90	1.5708	120	2.0944	150	2.6180

*Angle formed by radii lines drawn perpendicular to legs of bend.

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. . . Month's Talk, from page 28

test procedures and standards so that further development can go forward unrestricted. If at all possible, the American Society of Body Engineers should participate in this development program. For instance, Fisher Body, Division of G.M., has established their own standards by testing and comparing, and now recognize six vendors who manufacture satisfactory laminating materials. At present they are testing our resin with a non-toxic hardener which will minimize the dermatitis problems inherent with present epoxy materials. Many such developments will be made public in the year ahead as research in this field is progressing rapidly.

Presenting . . . Representing . . .

The E. Horton & Son Co. has appointed **E. J. Somerville,** Chicago, as manufacturers' representative in the Illinois and Wisconsin area.

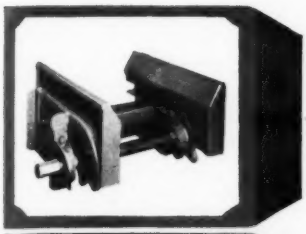
The Black Diamond Saw & Machine Works, Inc., has announced the appointment of **Edward Blake Co., Inc.,** W. Newton, Mass., as its exclusive representative for the Black Diamond Precision Drill Grinder and Worcester Drill Grinder.

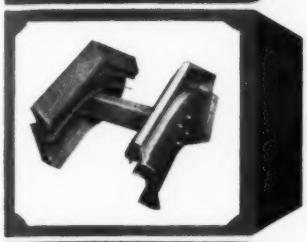
The **Sullivan-Cassimus Co.** of Los Angeles and San Francisco is now West Coast representative for the **Federal Tool Engineering Co.,** manufacturers of small and miniature welding equipment.

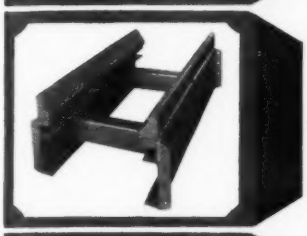
Baldwin Supply Co., Charleston, W. Va., was recently authorized as a **Carboloy** carbide distributor by Carboloy Department of General Electric. Baldwin handles Carboloy's standard line of tools and blanks, special tools and blanks, and diamond wheel dressers.

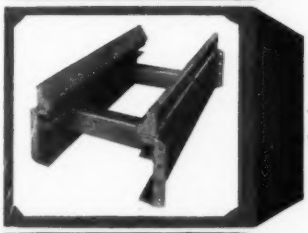
The line of metal cutting and parts manufactured by **Stone Machinery Company** is now being handled in central and eastern Wisconsion by **State Machine Tool Co.** of Milwaukee.

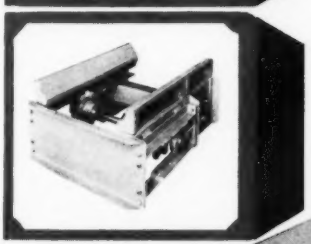
Brush Electronics Co. has named six new representatives to handle its Surfindicator, surface roughness measuring instrument. They are: **Dolph Boettler and Co.,** St. Louis; **Claude Mann and Associates,** Wichita; **Glade Ives,** Kansas City, Mo.; **Engineering Sales Co.,** Houston; **Wepfer Engineering Sales Co.,** Memphis; and **Argost, Frost & Grant, Inc.,** New York City.











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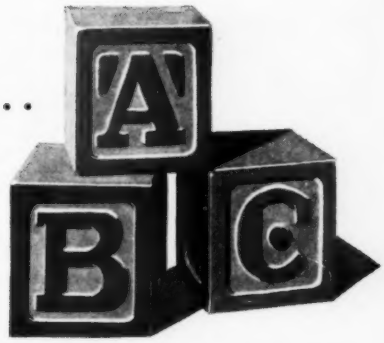

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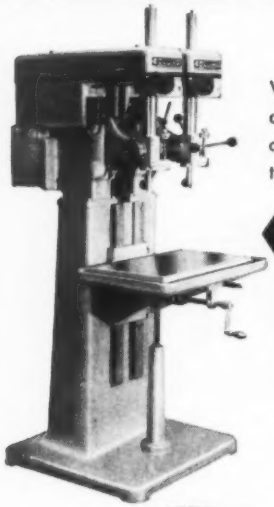

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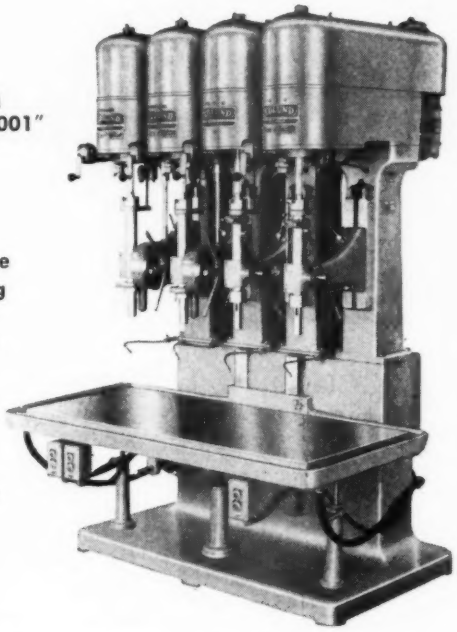

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• His advice is sound and his delivery of needed equipment speedy. Count on him in time of trouble, as a pilot does on an airport tower, to help keep your plant humming smoothly.

• He saves money for the firms who make the supplies and equipment you buy, just as he saves money for you, by reducing their costs of inventory and distribution. Result: lower prices than if you bought direct from these suppliers.

Imagine an airport without a control tower, where every plane had to call every other plane! Imagine the hopeless confusion of Industry, where every industrial consumer had to deal directly with every supplier for his needs. That's why Nicholson File Company firmly believes that the Industrial Distributor way of marketing gives you the best service at the lowest cost. We have marketed exclusively through distributors for more than 40 years.

Your Industrial Distributor's field men have highly specialized knowledge of files and filing. Are you taking fullest advantage of their sound technical advice?

NICHOLSON FILE COMPANY

Providence, R. I.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

World's foremost manufacturer of A FILE FOR EVERY PURPOSE

CIRCLE INFORM-A-GRAM KEY NO. 35

You can set a new High-Torque Unbrako self-locking socket set screw and forget it—it stays tight

There are several reasons: the deeper socket which gives you better purchase with the wrench; the rounded socket corners which eliminate the sharp corners where cracks start; the special methods of heat treatment in atmosphere-controlled furnaces; the development of fully formed threads.

Up to 40% higher tightening torque— a new Unbrako feature

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

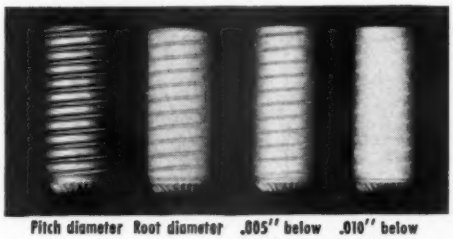
SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

ALL UNBRAKOs can withstand higher tightening torques than ordinary set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary set screw.

These microphotographs illustrate just what fully formed threads do for the new High-Torque UNBRAKO. They make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Screws with cut or ground threads lose thread form at root diameter.

You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.

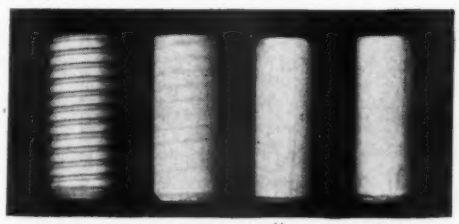
Unbrako Set Screw



Pitch diameter | Root diameter | .005" below root diameter | .010" below root diameter

Fully formed threads make the whole screw stronger. The metal is compressed into a closely knit grain structure. The grain flow follows the contour of the threads. The UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Screws with cut or ground threads lose thread form at root diameter.

Ordinary Set Screw

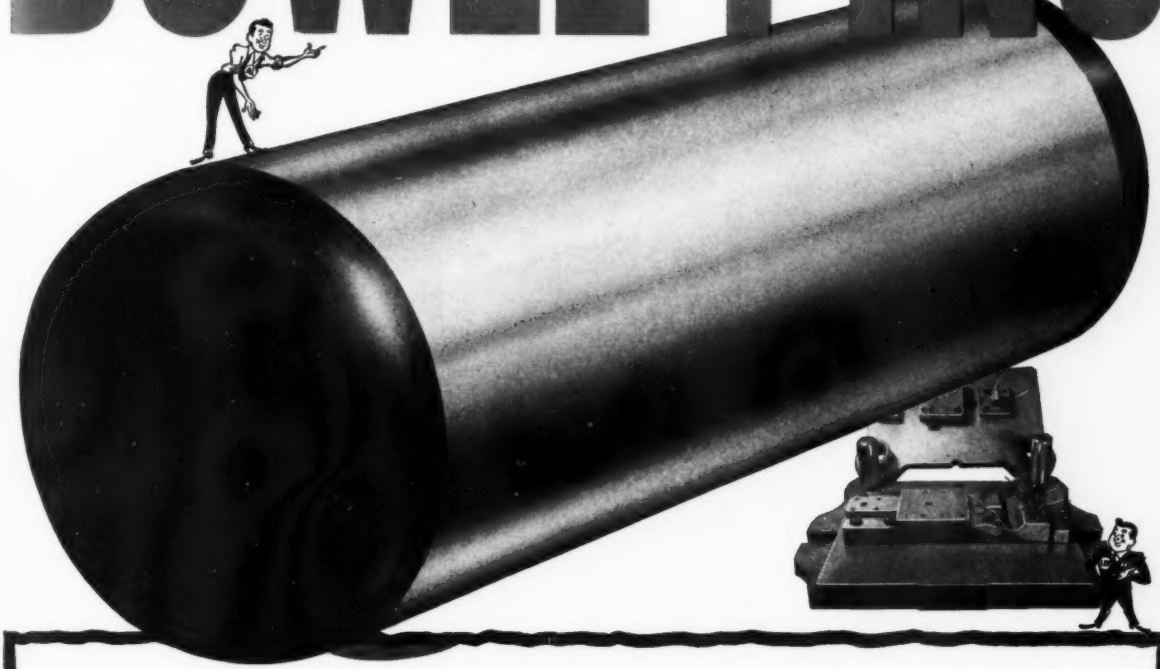


Pitch diameter | Root diameter | .005" below root diameter | .010" below root diameter

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

DOWEL PINS



HOW TO USE THEM

1. Precision Dowel Pins are principally used where parts must be accurately positioned and held in absolute relation to one another whether stationary or in motion. They facilitate quick disassembly and completely accurate re-assembly.

2. Allen Dowel Pins are also used as plug gauges.

3. As plugs for determining angular dimensions of dovetail slides.

4. As hinge and wrist pins in applications requiring initial and permanent accuracy.

5. As accurate, economical roller bearings and axles.

6. As guide pins, stops and position locators.

HOW TO JUDGE THEM

1. *On precision, for low tolerance applications.* (Allen Dowel Pins are ground to a maximum microinch finish of 6 RMS protected by a rust preventive.)

2. *On strength, for shear resistance.* (Allen Dowel Pins are made from special Allenoy Steel, heat treated. Single shear strength measures from 160,000 to 180,000 psi.)

3. *On hardness of surface and a core hard enough to prevent "mushrooming" when driven into a tight hole.* (Allen Dowel Pins have a surface hardness of 62-64 Rockwell C Scale and core hardness of 52-54. Average case depth .010 to .020 depending on size.)

The simple sure way to be sure of uniformly superior dowel pin quality is the same as in buying precision socket screws — *get genuine Allens from your Industrial Distributor.* Only he sells them but *we will welcome your direct request for literature or application engineering assistance.*

ALLEN HEAD

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

Available in 108 Standard Sizes from ⅛" x ⅜" to 1" x 6". Standard tolerance .0002 oversize. Most sizes also standard in .001 oversize for repair work.

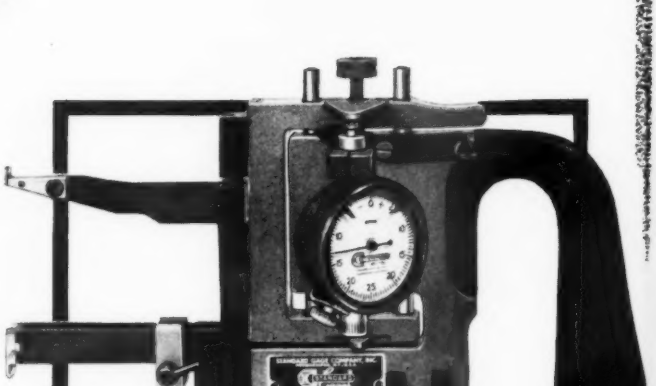
CIRCLE INFORM-A-GRAM KEY NO. 37

MEASURE I. D. GROOVES

FROM .375" TO 8" AND MORE

WITH THE SAME BASIC UNIT!

TYPE shown above for grooves down to .375".



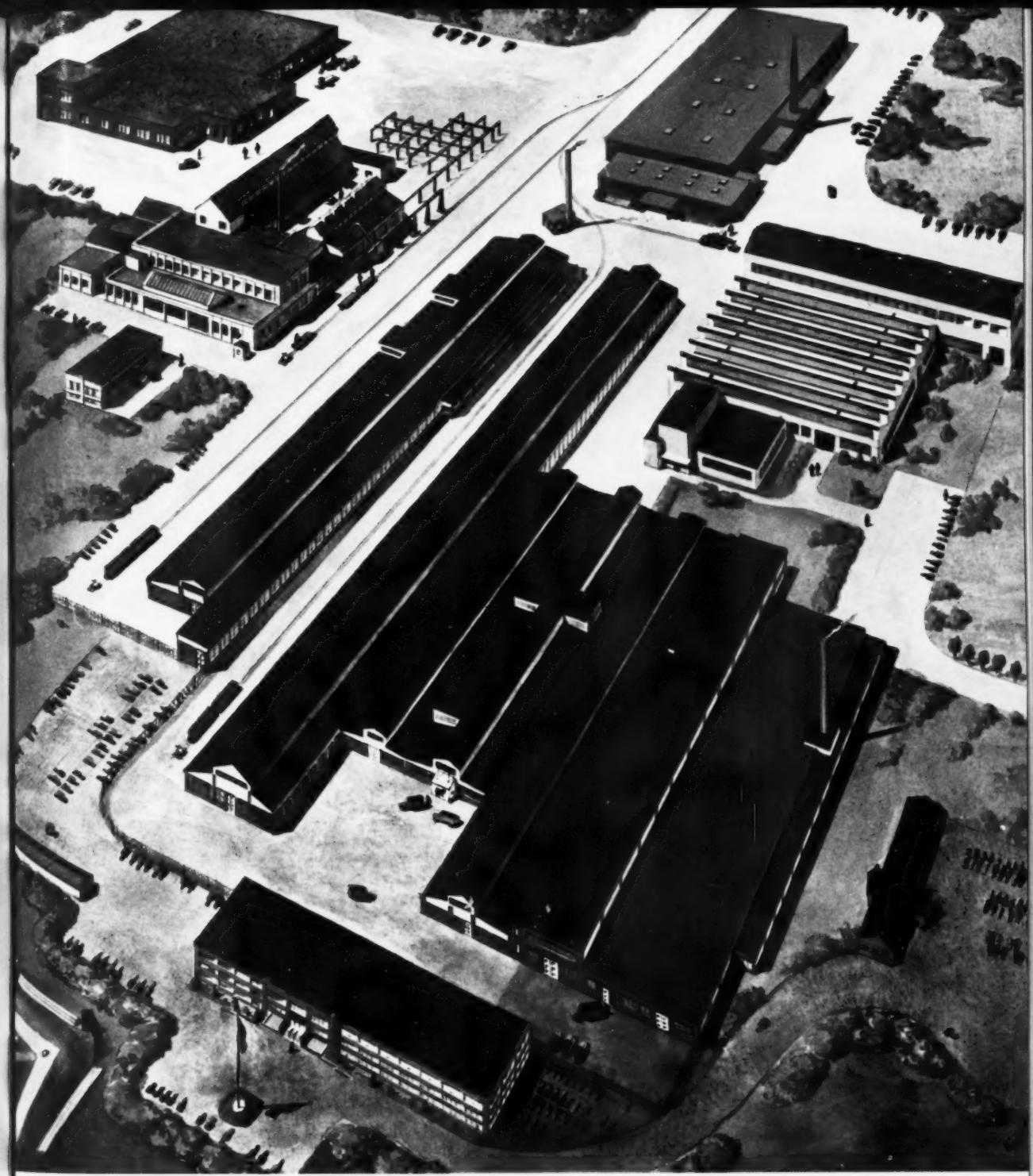
THREE SIZES of type shown at right measure from .625" to 8" and more. These are equipped with adjustable backstops, which automatically locate the groove for more rapid checking. Steel or tungsten carbide tips are removable and can be furnished to various specifications.

THESE INTERNAL groove gages are built around Standard's recently developed Versa-Dial, a multi-purpose dial unit capable of a large variety of both internal and external gaging applications, including threads, gears, counterbores, shallow diameters, etc. Write for details.

STANDARD GAGE COMPANY, INC.

56 PARKER AVENUE STANDARD® POUGHKEEPSIE, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 38

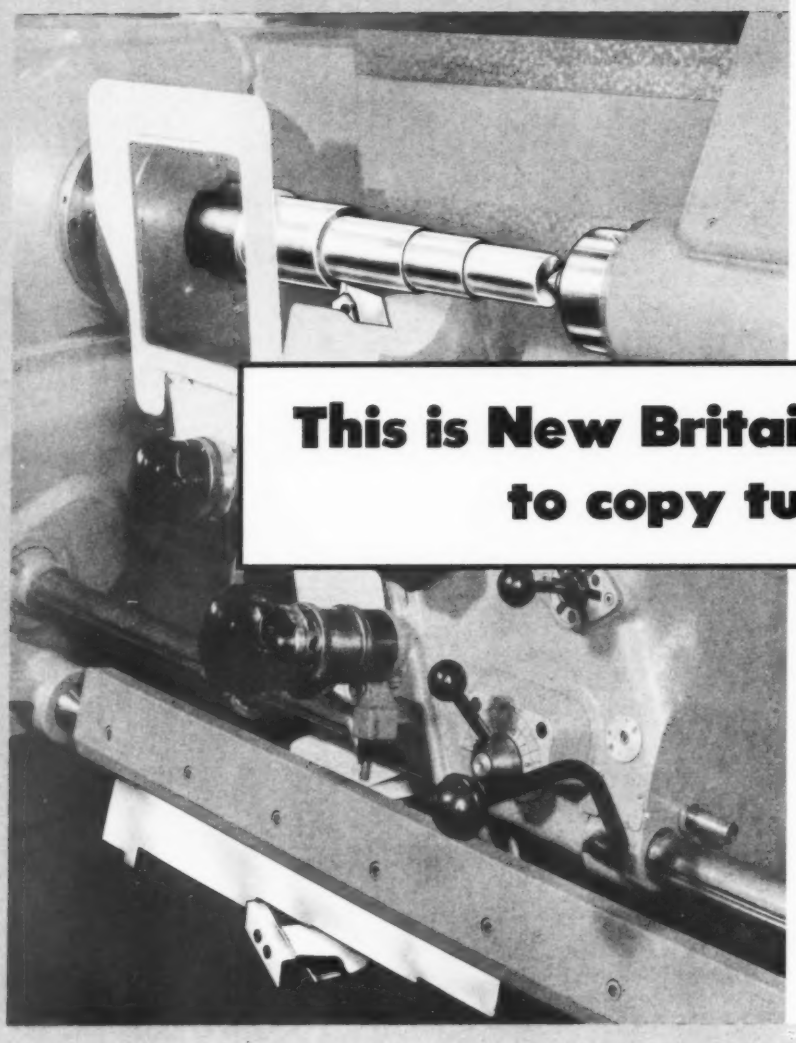


This is The New Britain Machine Company . . .

A composite view of The New Britain Machine Company's six plants in New Britain, Connecticut; Springfield, Massachusetts; Cleveland, Ohio; and Dayton, Ohio . . . built on a foundation of sixty years of service to the world's metalworking industries. Its machine tool divisions produce: ➡

- **Automatic Bar Machines**
- **Automatic Chucking Machines**
- **Precision Boring Machines**
- **New Britain +GF+ Copying Lathes**
- **Lucas Precision Horizontal Boring, Drilling and Milling Machines**
- **Special Automatic Metalworking Machines**

For news of New Britain developments that could improve your production methods, see the four following pages.

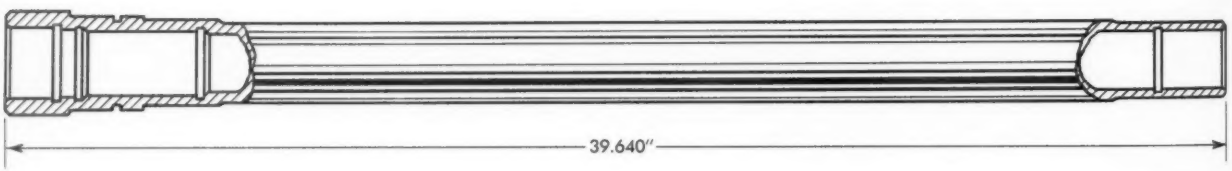


See it in operation

Ask your New Britain representative for a showing of the color motion picture "A NEW APPROACH TO COPY TURNING." Or write The New Britain Machine Company, New Britain, Connecticut.

This is New Britain's approach to copy turning

Can you find profit opportunities in *your* shop with this new approach? Let your New Britain man help you . . . that's his business.



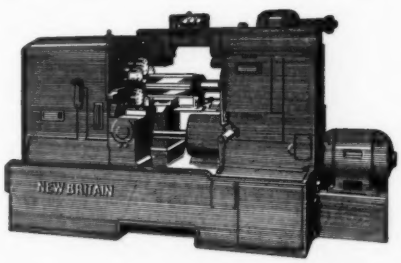
Saves $10 per piece and $3,000 worth of gauges plus labor and overhead on two machines

These are the five operations which formerly required four separate set-ups on three different machines: (1) Rough turn three Outside Diameters, (2) rough turn four Outside Diameters, (3) face large end, center, bore three Inside Diameters, undercut and chamfer three surfaces, (4) face end to length, bore center and undercut, (5) finish turn six Outside Diameters, undercut, form radii and chamfer — all this machining is done in five operations on one New Britain +GF+ Copying Lathe.

New Britains are "naturals" for work like this

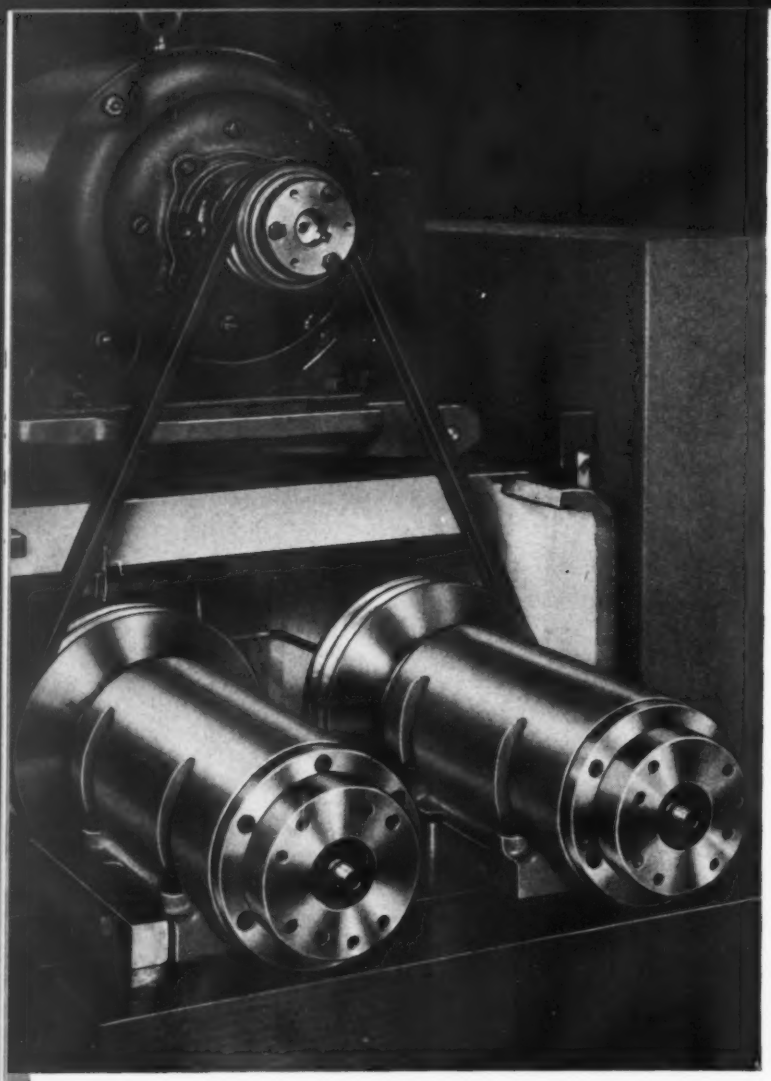
New Britain alone makes *both* tool rotating

and

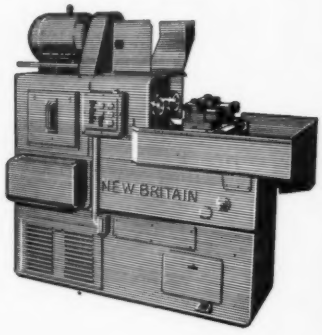


work rotating chucking machines, to provide the best approach to economical production of your work.

The two preceding pages and two following present other New Britain *New's*.



Spindle accuracy is the first essential to holding close tolerances on a boring machine. To utilize this accuracy New Britain spindles are mounted on a stationary bridge securely bolted to the rigid frame of the machine. Drive motor is mounted on a separate bridge above the spindles . . . table is not affected by motor heat and vibration.

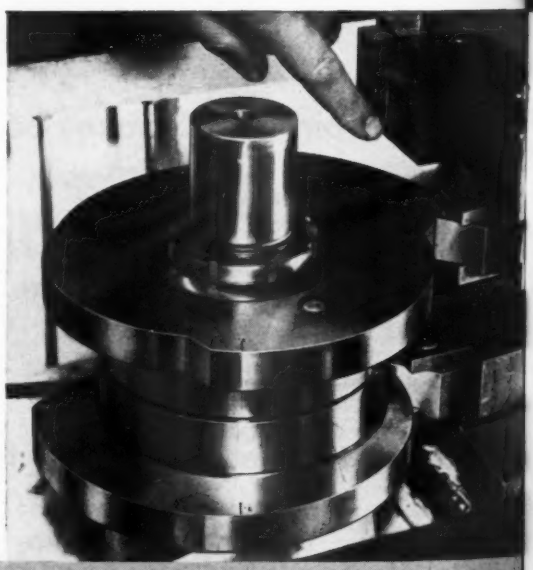


Secret of permanent boring machine accuracy:

Pinpoint control protected by the mass of the machine

A true running cam shaft preserves the accuracy of the tool path. Easily accessible precision cams are mounted on a shaft, straddle mounted directly to the frame of the machine (top bearing bracket has been removed in this photo). Top and bottom cam shaft bearings are a minimum distance from the cam. The shaft keeps its accuracy because of this rigid mounting, and also because the thrust from both cam followers is in one direction.

New Britain Precision Boring Machines have provided a new approach to the fast production of problem pieces in America's leading high output plants. Ask your New Britain man or write The New Britain Machine Co., New Britain, Conn., for the book, "24 COST CUTTING JOBS."



This is an easy job for a Lucas

LUCAS OF CLEVELAND

This twenty-foot weldment requires a combination of milling, boring and key slotting, all of which are performed in one setting. Backrest was removed from the machine, and the work is supported on an auxiliary table. *(Photo courtesy Steel Equipment Co., Cleveland, O.)*

This awkward work piece is another demonstration of Lucas flexibility. A LUCAS PRECISION HORIZONTAL BORING, DRILLING AND MILLING MACHINE does a wide range of work easily, accurately and inexpensively. You have ruggedness, accuracy and flexibility of work handling that you can count on.

Automatic power positioning enables you to positively repeat operations on any number of pieces. New ultra-simple pendant control is always at the operator's fingertips. Let your Lucas representative show you how far your machine-tool dollar can go, invested in this most versatile machine in any shop.

LUCAS MACHINE DIVISION
The New Britain Machine Company • Cleveland 8, Ohio

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN +GF+ COPYING LATHES

See the preceding four pages for other New Britain *New's*.

Tool Steel Clinic on Two Feet

YOUR MILNE SALES-ENGINEER

Your local Milne man is a tool steel specialist, trained to help you solve your tool material problems. He's an expert in tool steel characteristics and applications who can help specify exactly the right steel for the job.

He represents MILNE, America's Leading Tool Steel Specialists. That means he has a tremendous range of grades, sizes, shapes and finishes of tool steel to draw upon, including many unusual ones that are hard to find elsewhere.

Milne has grown up in the tool steel business. Its CONCENTRATION and SPECIALIZATION on this field is reflected in the variety of its warehouse stocks and the special knowledge in the minds of its representatives.

If tool steel is involved, call in a specialist ...call MILNE.

Write For Milne's
NEW TOOL
STEEL SELECTOR

Includes several newly developed Milne tool steels

WAREHOUSES:

New York
Chicago
Boston
New Britain, Conn.
Philadelphia
Pittsburgh
Cleveland
Dayton
San Francisco
Atlanta
Detroit
Seattle

SALES OFFICES:

Rochester
St. Louis
Bridgeport
Louisville
Worcester
Milwaukee
Birmingham
Madeira Beach, Fla.

SALES AGENTS:

Taywood Steel Products, *Bell, Los Angeles*

Pacific Machinery & Tool Steel Co., *Portland, Oregon*

Maxwell Steel Co., Inc., *Fort Worth, Texas*

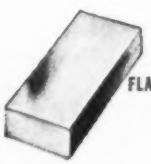
Geoffroy-Lane, Inc., *Denver*

Sanderson-Newbold Ltd. *Montreal-Toronto*

wide range of sizes and grades in

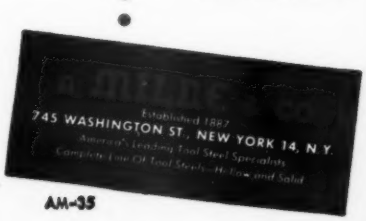
WATER HARDENING • NON-DEFORMING • SHOCK-RESISTING HOT-WORK & HIGH SPEED TOOL STEELS

Full length Kolorkoted for permanent identification



And Tool Steels Only

Complete Line of Tool Steels ∧ Wide Range of Sizes and Grades



AM-35

the POWER you need in ⅓ less space...

O-M

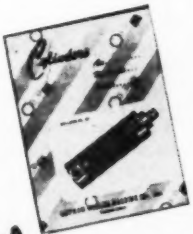
CYLINDERS
TIE ROD-LESS

- *air and hydraulic*
- *meet JIC standards*

O-M's special interlocking mechanism strips unnecessary bulk, does away with tie rods and out-sized end caps . . . saves up to ⅓ the installation space required by conventional-type cylinders of the same bore.

This internal locking feature means less maintenance, too, O-M cylinders are easier to clean, inspect, remove, disassemble and service, with no alignment problems in re-assembly.

Available in complete range of sizes (1½ to 8" bores), with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts. Immediate delivery on many sizes.



mail coupon now!

for FREE catalog, showing all cylinders, mounts and mounting brackets.

ORTMAN-MILLER MACHINE COMPANY
19 143rd Street, Hammond, Indiana

☐ **Have representative call** ☐ **Send latest catalog**

Name_____ **Position**_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

CIRCLE INFORM-A-GRAM KEY NO. 45

Zagar Tools

HOLD YOUR WORK—AND YOUR BUSINESS!

Collet indexing fixture

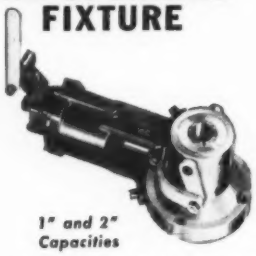
Collet holding fixture

Vertical-horizontal collet fixture

ZAGAR HOLDING and INDEXING FIXTURES

Zagar fixtures offer you a most inexpensive way to machine small parts. Set-up is speeded and much special tooling eliminated. Slot milling, straddle milling, drilling, tapping and grinding of small pieces can be done most profitably with Zagar fixtures, *available from stock.*

AIR-OPERATED FIXTURE



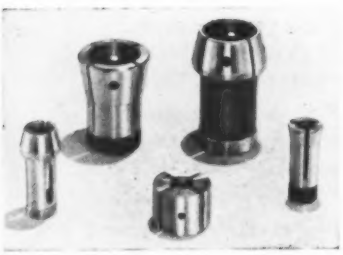
1" and 2" Capacities

Manual or mechanical control is optional on the "Air-O." The cam or chain can be readily connected. Solenoid operation is possible for the valve control. Parts are interchangeable. Far out-speeds hand operation.

COLLET LATHE CHUCKS

1" and 2" Capacities

Zagar chucks are easily adapted to any make of lathe, grinder or rotating spindle. Handles bar stock—lengthwise, with no movement. Speeds loading and unloading. Can be opened and closed while machine is running.



COLLETS, PADS, BLANKS

Five types: No. 310 Zagar Master; Nos. 2 and 6 W. & S.; No. 5-C; No. 6 W. & S. pads. All but Zagar No. 310 are standard machine tool sizes. All collets are made of oil-hardened tool steel; have flat tops for locating purposes.

WRITE FOR ENGINEERING SHEETS "T-12" ON EACH PRODUCT

ZAGAR TOOL, INC.
24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 46

The new Western district sales manager for Houdaille-Hershey of Indiana, Inc. will be **J. D. Weatherford.** He'll supervise sales for eleven Western states with headquarters in Los Angeles. **Carl F. Holland,** who will serve as the company's Southern district sales manager, will have headquarters in Memphis.

◆

E. W. Bliss Co. has named **Jack E. Garnhart** as Chicago district manager. **William J. Stasko** will serve as sales engineer in the same district. The appointment of **George Baillie, Jr.,** as sales manager of the Roller Mill Div'n in Salem, O., was also announced.

◆

Charles C. Snider has been appointed manager of field sales for Consolidated Engineering Corp. His headquarters will be in Pasadena, Calif. Succeeding him as manager of the company's southeastern regional sales office in Atlanta, will be **Joseph E. Jenkins.**

◆

Clay R. Brahm recently joined the sales staff of the Metal Processing Chemicals Dept. of Pennsylvania Salt Mfg. Co. He has been assigned to the company's St. Louis territory, replacing **Frank Wilcher** who was transferred to Louisville.

◆

Harris H. Robbins has rejoined Vascoloy-Ramet Corp. as assistant district supervisor for the W. Hartford, Conn., area.

◆

Robert H. Johnson, an abrasive engineer for Norton Co., has been assigned to a new territory consisting of Florida and the southern portions of Georgia and Alabama. His post in eastern Iowa will be taken over by **Raymond Goodale.**

◆

Hunter Douglas Corp. has appointed **T. W. Fredericks** as resident sales representative for the Detroit area. His new duties include sales engineering of aluminum cold forgings and impact extrusions.

◆

Sidney W. Wray has been transferred to the Seaboard Coil Spring Div'n of Associated Spring Corp. in Gardena, Calif. He had formerly been a sales engineer with the company's Wallace Barnes Div'n, Bristol, Conn.

Making good—fast!

NEW the Norton R51 Centerless Feed Wheel

Not just the "other" wheel on your centerless grinding setup — not just another feed wheel! But a Norton "Touch of Gold" development that proves the importance of the feed wheel to economical centerless grinding.

Users report latest Norton development a top-performing aid to better, lower cost centerless grinding

Shopmen who have tried the new Norton R51 centerless feed wheel have come out strong for this latest Norton aid to more efficient centerless grinding. Here are some typical R51 performance reports:

"They hold form twice as long as previous wheels."

"No slipping, lighter cut with diamond required when truing."

"An excellent wheel; no chipping, holds a much better corner and dresses easier."

"Eliminates chatter and gives us better all around grinding results."

The secret of this greatly improved performance is in the exclusive Norton manufacturing methods. The unique abrasive-and-bond combination lengthens wheel life, increases form-holding ability, reduces the need for dressing and eliminates slippage. And as a result of close control during manufacture, R51 wheels are consistent throughout — from wheel to wheel and lot to lot.

Finally, you get time-and-money-saving simplification with R51's. Just one grain and grade will handle the widest range of jobs.

Heighten the "Touch of Gold" in your centerless operations by teaming up the new R51 feed wheel with the right Norton grinding wheel. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

R51 wheels are available in all common feed wheel sizes. For complete facts write to NORTON COMPANY, 97 New Bond Street, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1681

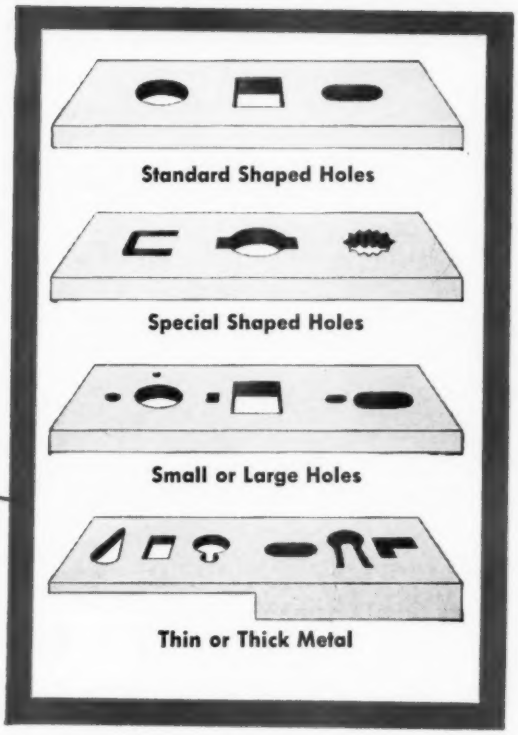
NORTON
ABRASIVES

Making better products... to make your products better

NORTON COMPANY: Abrasives • Grinding Wheels Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives Sharpening Stones • Pressure-Sensitive Tapes

CIRCLE INFORM-A-GRAM KEY NO. 47

WHEN R-B Punches Are Used



What are your piercing or forming requirements —standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? There is either an R-B punch in standard shapes and sizes or R-B will manufacture special punches, die buttons and retainers to your specifications that will provide more efficient piercing operations.

Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

R-B Engineering Service Is Available for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 73 • 12635 BURT RD. • DETROIT 23, MICH.

Please send me additional information.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 48

RECENT PATENTS
Of Tooling Interest

Compiled by
Melvin Nord
Patent Attorney
Detroit, Michigan

Lapping Method

U.S. 2,697,900, issued Dec. 28, 1954 to Thomas G. Lewis, and assigned to E. I. du Pont de Nemours & Co., provides a method of lapping metallic articles fabricated from non-homogeneous or inclusion-bearing metal alloys or metals, and to develop a high quality surface finish free of pits and scratches.

According to the inventor, it is possible to lap such surfaces to finishes having qualities better than 1.0 micro-inch with high dimensional accuracy by forcing a diamond dust abrasive against the work with a balsa wood lap in the presence of

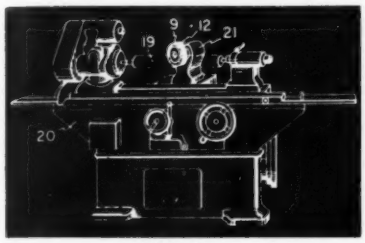


Fig. 1

a small amount of wax, while maintaining a predetermined pressure of contact and a high relative speed of translation of the surfaces. It is believed that the peculiar nature of the balsa wood and of the thin layer of wax placed between the lap face and the work combine to give an optimum compromise between cutting rate and differential heat

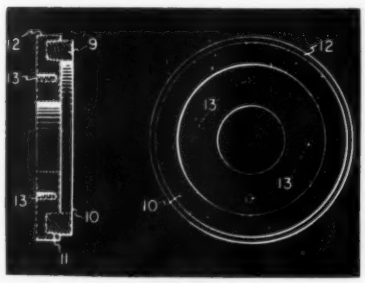


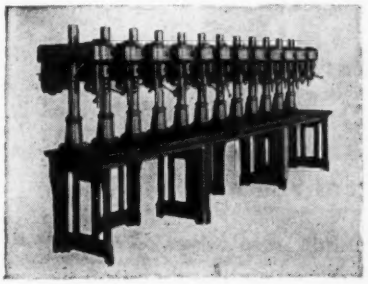
Fig. 2

generation to achieve the high surface qualities which are obtained.

The lapping operation can be carried out with such conventional equipment as shown in Figure 1. The lap is shown in Figure 2. The balsa wood (9) is an annulus cut from a block so that the ends of the wood fibers make up the working face (10) which contacts the work during lapping. Since the lap is subjected to relatively high stresses

. . . *Continued on page 58*

Add as many spindles as you want – and multiply your savings – with this combination designed for economical production drilling. You will note, as indicated by the drawing and photos, that you may combine *any number of Table Sections* to accommodate just the right number of 20" LIGHT-HEAVYWEIGHT Drill Press Spindles to fit the specific jobs you have to do.



Walker-Turner LIGHT-HEAVYWEIGHT
20" Multi-spindle Drill Press
(Six Table Sections – 12 Drilling Units)

This LIGHT-HEAVYWEIGHT combination gives you the maximum in flexibility and economy. The number of intermediate Table Sections determines the number of Spindles which can be varied to fit the nature of your work and output requirements. Best of all, you avoid the heavy expenditure for costly, specialized equipment.

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KEARNEY AND TRECKER CORPORATION
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PRODUCTION COST Cut 2/3

You Can Make a Similar Saving in Your Assembly Department!

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Will You Be There?

Dec. 5-9. 25th Exposition of Chemical Industries. Convention Hall, Philadelphia, Pa.

•

Dec. 7-9. National Association of Manufacturers. Annual Meeting and Exhibit. Waldorf-Astoria, New York, New York.

•

Dec. 10-16. Atomic Exposition. American Institute of Chemical Engineers. Cleveland Public Auditorium, Cleveland, Ohio.

•

Dec. 12-13. Material Handling Institute. Annual Meeting. Statler Hotel, New York, New York.

•

Dec. 12-16. Nuclear Engineering & Science Congress. Engineers Joint Council. Cleveland Public Auditorium, Cleveland, Ohio.

•

Jan. 9-13. Society of Automotive Engineers, Inc. Annual Meeting. The Sheraton Cadillac and Statler Hotels, Detroit, Michigan.

•

Jan. 18-20. Society of Plastics Engineers. 12th Annual Conference. Statler Hotel, Cleveland, Ohio.

•

Jan. 23-26. Plant Maintenance and Engineering Conference and Show. Convention Hall, Philadelphia, Pa.

•

Jan. 23-27. Gaillard Seminar on Industrial Standardization. American Standards Association. New York, New York.

•

Jan. 30-Feb. 3. AIEE Winter General Meeting. Hotel Statler, New York, New York.

•

Feb. 1 & 2. Midwest Welding Conference. Armour Research Foundation, Illinois Institute of Technology, Chicago, Illinois.

•

Feb. 7, 8, 9. 11th Annual SPI Reinforced Plastics Division Conference. The Society of the Plastics Industry, Inc. Hotel Chalfonte-Haddon Hall. Atlantic City, N. J.

•

Feb. 16 & 17. Conference on "Materials Handling". Purdue University's Dept. of Industrial Engineering and Indianapolis Chapter of the American Materials Handling Society. Purdue Memorial Union Building, Purdue University, Lafayette, Indiana.

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With the right type blade for the job...
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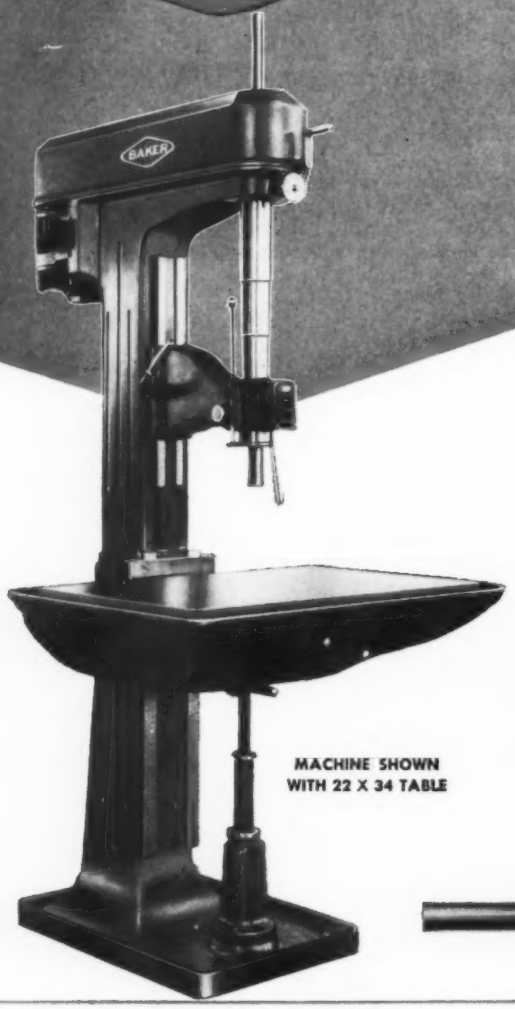

MACHINE SHOWN WITH 22 X 34 TABLE

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Spindle centerline to column face	12"
Spindle speeds—with 1200 R.P.M. motor	275-1375*
Spindle travel	7"
Rack travel	10"
Table adjustment	32½"
Morse Taper in spindle nose	#2 or #3

*Speed adjustment between the lowest and highest speed is INFINITE through selector.

BAKER BROTHERS, INC.

TOLEDO, OHIO

DRILLING...TAPPING...KEYSEATING...CONTOUR GRINDING MACHINES

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Starting with a revolutionary idea, the *original* Sheet Metal Screw, Parker-Kalon has become the leading manufacturer of Self-tapping Screws and other fasteners essential to low-cost assembly of thousands of products.

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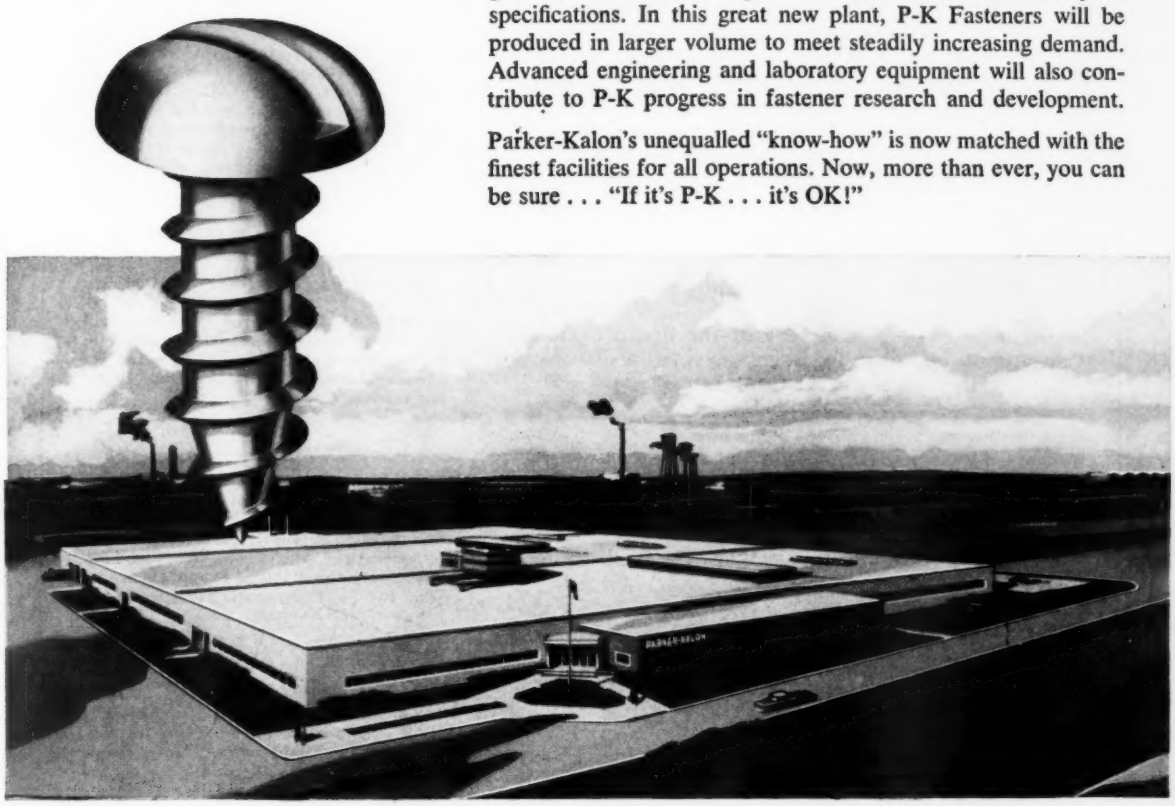
Parker-Kalon's unequalled "know-how" is now matched with the finest facilities for all operations. Now, more than ever, you can be sure . . . "If it's P-K . . . it's OK!"



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MANUFACTURING MEMOS

Awarded Contract . . .

● Jack & Heintz, Inc., has been awarded a contract to develop the complete alternating-current generating system for the new Douglas DC-8 jet transport.

New Laboratory . . .

● The U. S. Navy Radiological Defense Laboratory is the only research organization in the country solely devoted to the study of nuclear radiation effects. The new $8,500,000 main building was dedicated recently.

Elected and Reelected . . .

● William F. Rockwell, Jr., president of Rockwell Mfg. Co., was elected president of the Pennsylvania State Chamber of Commerce. He will serve for one year.

● J. Heber Parker, chairman of the board of The Carpenter Steel Co., has been reelected a director of the National Industrial Conference Board. He was elected a director in 1943.

● The new president of the Investment Casting Institute is V. S. Lazzara, president of Casting Engineers, Inc. R. S. Banister, Midwest Foundry Co., will serve as the Institute's vice president. Both were elected at the ICI annual meeting in Detroit last month.

● As the first step in an expansion and diversification program, Van Norman Co., will acquire the business and assets of Insuline Corp. of America. The new subsidiary located in Manchester, N. H., manufactures electronic and electro-mechanical components and assemblies. Insuline has also been a prime producer and sub-contractor for Defense Agency and other government needs. The announcement of the acquisition was made by J. Y. Scott, president of Van Norman.

● The Elmer A. Sperry Award has been established by Dr. Sperry's daughter, Mrs. Robert Brooke Lea, and his son, Elmer A., Jr. The purpose of the annual award is to commemorate Dr. Sperry's achievements and to encourage progress in transportation engineering.

● Controlling interest in Kaye Development Co., Inc., S. Norwalk, Conn., has been acquired by Atomic Instrument Co., manufacturer of equipment for atomic energy and industrial application. Kaye makes electronic color evaluation instruments and related detection devices.

The purchase of the Barnaby Tools Div'n of Barnaby Mfg. Co., Bridgeport, Conn., has been announced by Roy T. Houghtaling, president of Hamilton Mfg. Co., West Haven, Conn. Barnaby produces screw machine and turret lathe tools. Stanley Roczynski, formerly with Barnaby, will head all manufacturing for the New Haven firm.

◆

The "1955 Growth Award" of the National Association of Investment Clubs has been won by The Cross Co. The company was selected on the basis of percentage of increase in sales and excellence, management, labor relations, profit margin, and product, while maintaining financial soundness and stability.

◆

Hufford Machine Works, Inc. has been purchased by a group of New York investors. M. L. Bengston, president, will head the company which is located in El Segundo, Calif. Hufford is noted for the manufacture of "Stretch-Wrap" forming machines.

◆

Whirlpool-Seeger Corp. is nearing completion of retooling in order to manufacture a new line of home freezer units. The RCA-Whirlpool freezers which will be introduced in the fall of 1956, will be manufactured in the expanded Evansville, Ind., plants recently purchased from International Harvester Co.

◆

The Nilsson Gage Co., Poughkeepsie, N. Y., is operating The Threadco Co., Berkley, Mich., as its midwestern division. The Berkley plant will add plain plug and ring gages to its current line of thread gages.

◆

Consolidated Vacuum Corp., wholly owned subsidiary of Consolidated Engineering Corp., has been merged with the parent organization. It will be known as ConVac Div'n of Consolidated. The company manufactures high-vacuum equipment.

◆

Oster Mfg. Co., Cleveland, has entered the material handling equipment field. In January, the company will market a line of multi-purpose, hand-propelled, hand and battery-operated portable lifts with capacities up to 2000 lbs.

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OF PRECISION TOOLING

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- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
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- ***A new complete manual of application data to assist the tool engineer will be furnished on request.***

Manufacturers' Representative: A few desirable territories are being opened to qualified representatives. Please write for detailed information.

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HERE'S WHERE COSTS CAN BE CUT... WITH LIQUAMATTE® WET BLASTING

FINISHING DIES

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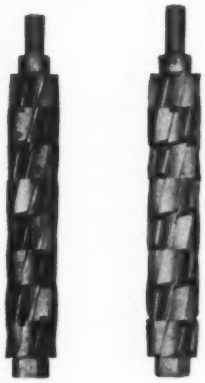
EXTENDING TOOL LIFE



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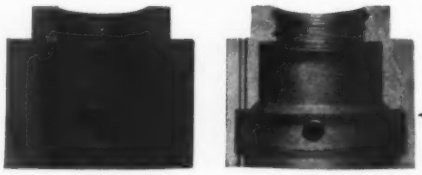

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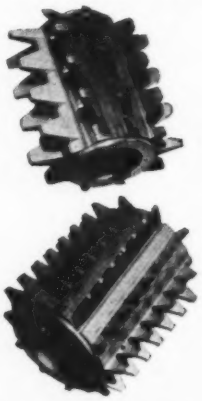
REMOVING FEATHER EDGES FROM TOOLS



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CIRCLE INFORM-A-GRAM KEY NO. 56

"Commendable Comments"

"Instead of condemning the trend toward automation, workers should be more concerned if their employers do not utilize every technological improvement to maintain their competitive position."

—Dr. Haldon A. Leedy, director of Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

"No one company can possibly learn as much as can a hundred companies. When any one of you lick a problem or perfect a new development, in one way or another it helps the whole industry. And when you get as many different organizations as are represented here today aggressively trying to move forward it sort of rubs off from one to another and the whole industry moves forward."

—by Leland I. Doan in a presentation at the 11th Annual Convention, The Magnesium Association, New York City.

"So great is the faith in the inevitability of atomic power that an increasing number of industries are prepared at this time to foot the entire cost of building and operating experimental plants, even though they know in advance that those installations will not be economic if one excludes from the return the knowledge we will gain from them. It is investment in the future on the part of American industry."

—From remarks prepared by Lewis L. Strauss, Chairman U. S. Atomic Energy Commission, for delivery to The National Industrial Conference Board, 4th Annual Conference on Atomic Energy in Industry.

"There is no monopoly—and we seek no monopoly—in the harnessing of the atom for man's benefit. Rather, we seek to encourage participation in that task. In particular, we want the maximum participation of American industry. Our standard of living is a product of its tools & techniques. The magnitude of the return which can be realized by the application of those same tools and techniques to the new field of atomic energy is immeasurable."

—From a message from the President of the United States, Dwight D. Eisenhower, as related by Lewis L. Strauss, Chairman U.S. Atomic Energy Commission, at the 4th Annual Conference on Atomic Energy in Industry.

You can order 52100 tubing right now...

we'll ship tomorrow

WHEN you need 52100 steel tubing in a hurry, get us on the phone. We'll ship the next day. We stock 101 different sizes of Timken® 52100 steel tubing —from 1″ to 10½″ O.D. All of them are available for less-than-mill-quantity orders.

Timken 52100 steel can be used for most hollow parts jobs and many manufacturers have substituted it for more expensive steels. A high-carbon chrome steel, it's through-hardening in moderate sections. It can be heat-treated to file hardness and tempered back to any desired point.

Here are some of the jobs 52100 is now being used for: aircraft parts, ball bearing races, pump parts and plungers, collets, bushings, spindles, grinding machine parts and precision instrument parts.

The Timken Company is America's pioneer producer of 52100 tubing. We have an unequalled backlog of experience and as a result we can give you uniform quality from tube to tube—order to order. Every step of production is rigidly checked.

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SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

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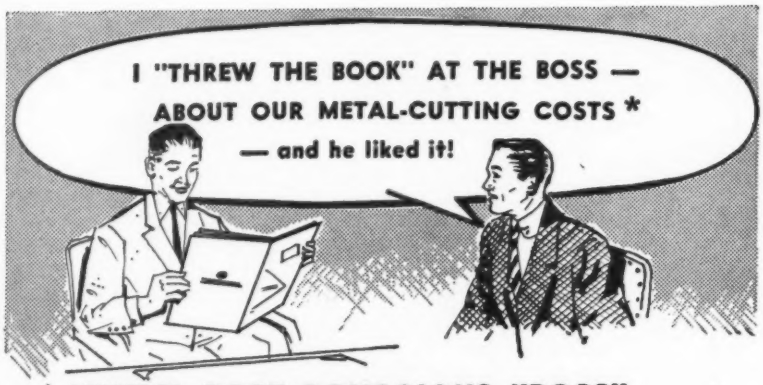
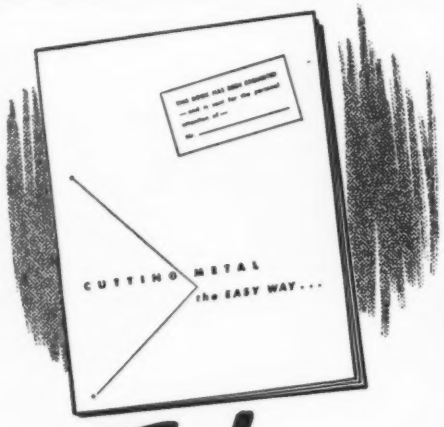
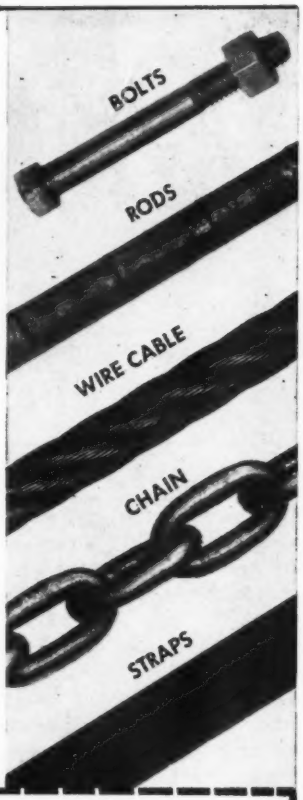


*EVERY COST-CONSCIOUS "BOSS" WILL LIKE THIS BOOK — if his company cuts any of these materials! —





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CIRCLE INFORM-A-GRAM KEY NO. 58

. . . Recent Patents, from page 49

during use, support is provided by mounting it tightly in the annular groove (11) of the circular metal holder (12) with a light drive fit and cementing it securely in place. The rear face of holder (12) is provided with tapped holes (13) for attachment of the lap to a spindle. The working face (10) is machined to a plane, smooth surface throughout.

The patent gives details as to the minimum allowable hardness of the balsa wood, the minimum speed and loading pressure, and the type of wax to be used.

Toolholder

U.S. 2,697,272, issued Dec. 21, 1954 to Herbert B. Clark, and assigned to Vascoloy-Ramet Corp., describes a toolholder for use with cemented carbide inserts. This invention makes it possible to provide a tool holder in which a cutting insert may be used down to a size where the unused remnant has a negligible length such as ⅛". The insert may be removed and replaced quickly and the cutting tip of the insert oriented automatically in the same position as formerly.

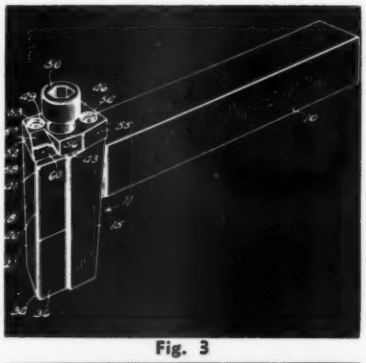

Fig. 3

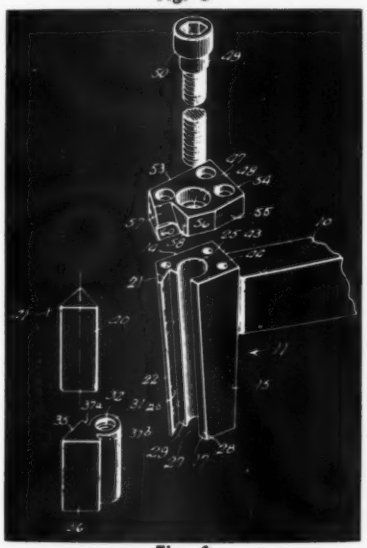

Fig. 4

The toolholder is shown in perspective in Figure 3 and in an exploded view in Figure 4. The cutting insert (40) may be removed by

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Seven Days a Week
that's the year 'round
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Chassis, cabs, wheels, etc., are turned out by the thousands at Tonka Toys . . . and each one has to be *perfect* to pass the critical inspection of today's boys and girls.

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Mound Metalcraft Company, the home of Tonka Toys, is now one of America's leading toy manufacturers. Their rapid growth is symbolized by their "repeat orders" year after year for additional Press-Rite Presses.

Press-Rite Presses ... Airflex Clutches . . . that's the combination that the folks at Tonka Toys have found gives them the highest production . . . at the lowest cost per unit.

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loosening clamping bolt (50) to drop clamping jaw (36). When replacing an insert, the active cutting edge (41) of the insert will always be properly positioned with respect to the tool holder. By virtue of the clamping action against the top and bottom of the insert, the length of the insert will have no effect on the effectiveness of the active cutting edge. Providing bolt (50) and nut (31) are properly dimensioned, it will be possible to draw the movable clamping jaw up as close as may be desired to the opposed clamping jaw.

Method of Thread Rolling

A method of producing threads on thread forming tools by rolling, instead of grinding, is described by Leo W. Bedker (East Detroit, Mich.) in U.S. 2,699,077, issued Jan. 11, 1955.

If for example it is desired to produce by rolling an American standard 60° thread, such as is shown in

Fig. 5

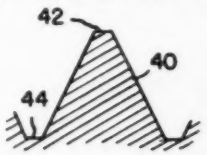


Fig. 6

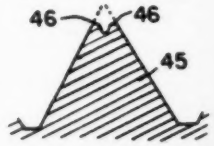


Fig. 7

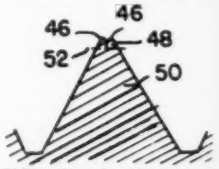
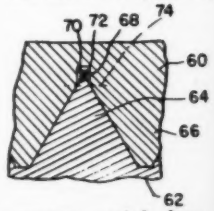


Figure 5, the difficulty is that one first goes through the stages shown in Figures 6 and 7. After grinding off the thread, as in Figure 7, there is left a crevice (48) which extends down into the crest of the thread, rendering the shaped metal unsatisfactory for use as a thread-forming tool. In order to prevent this, the thread rolling tool should contain a slot (68) as shown in Figure 8,

Fig. 8



which permits excess metal from the thread to be rolled up into the slot. Thus the crevice (72) can be kept above the dotted line representing the plane of removal of metal in forming the finished tool.

According to the inventor, threads produced on thread-forming tools by rolling are superior to those produced by grinding, in that they have improved grain structure due to the rolling operation, have a smoother surface, and have greater dimensional accuracy.

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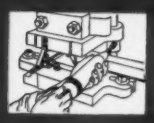

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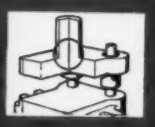

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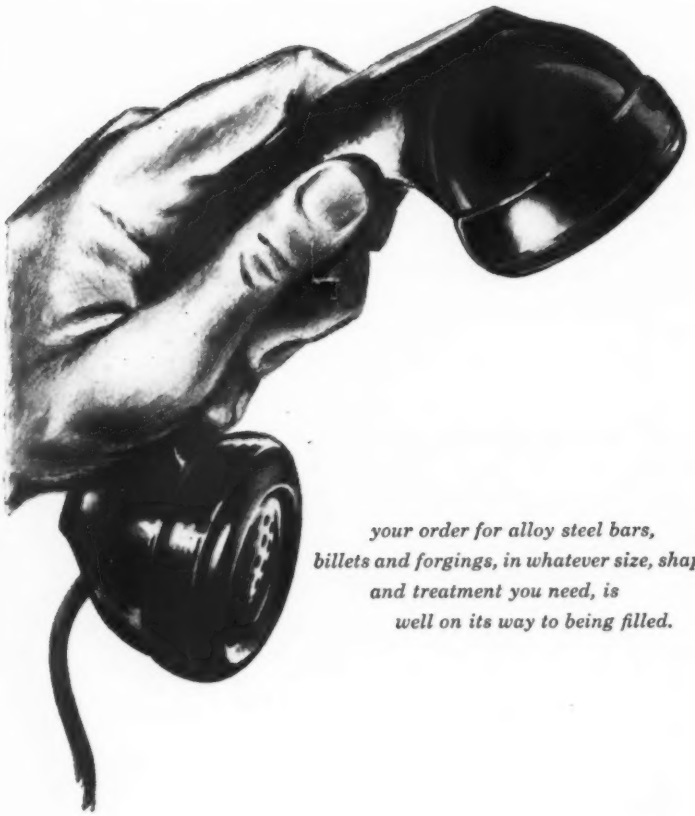

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CIRCLE INFORM-A-GRAM KEY NO. 62

POWER OF THE ATOM SHOWN THIS MONTH AT CLEVELAND

The list of 160 exhibitors in the International Atomic Exposition being held in Cleveland's Public Auditorium, Dec. 10-16, gives an idea of the broad impact which the atomic age apparently will have on Industry.

At the Nuclear Congress of 24 leading engineering and scientific societies and trade organizations, held in conjunction with the Exposition, papers from industry, government agencies, and universities will discuss peacetime uses of atomic fission and radiation and related nuclear applications. Many of the papers have been declassified by the AEC expressly for the Congress.

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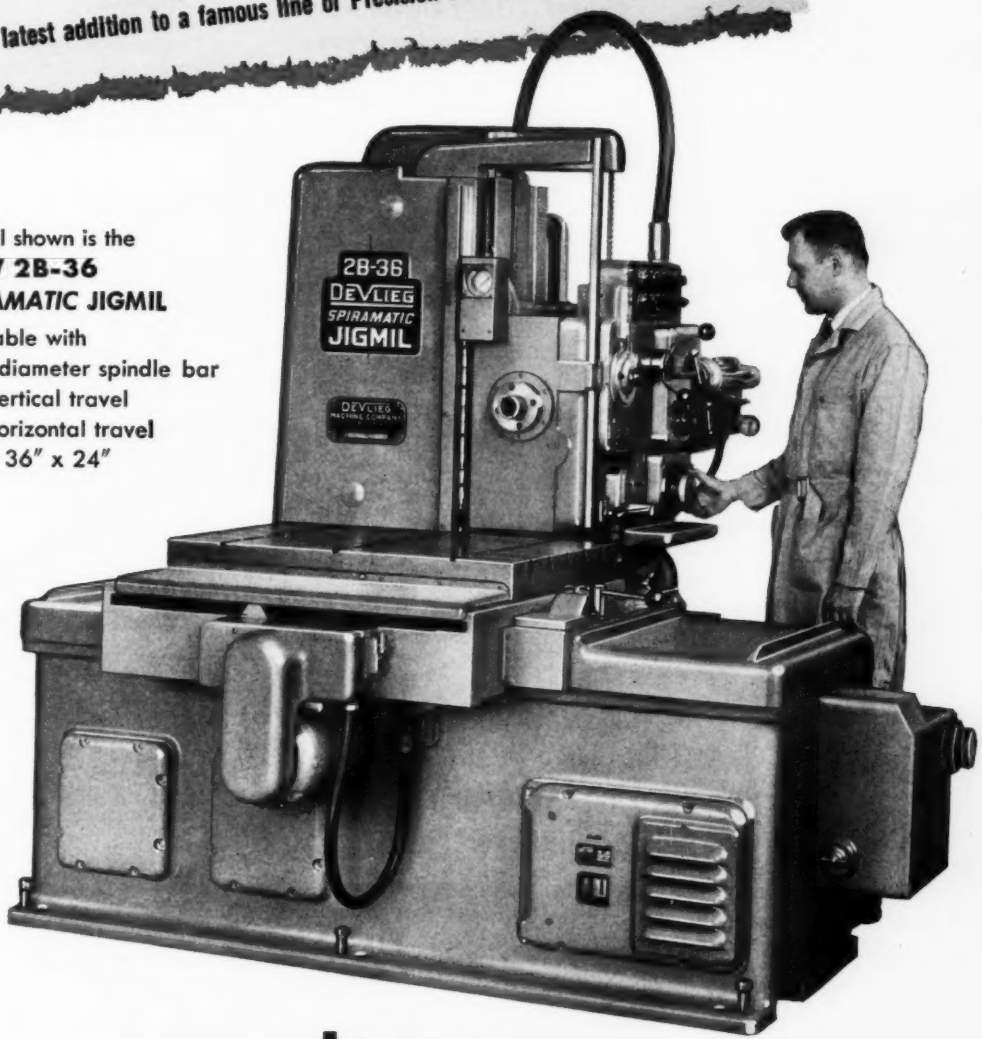

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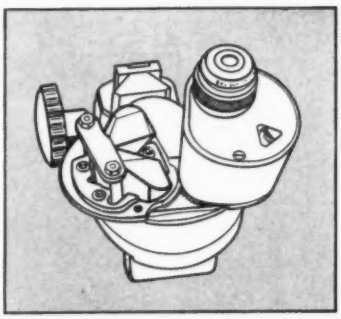

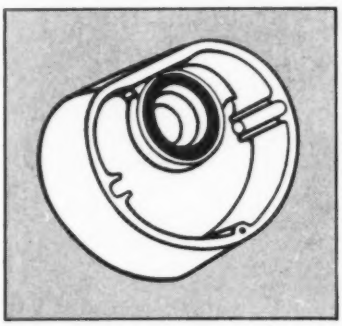

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Top Management, bankers, and investors will get a "pocketbook" digest of atomic energy and what it can mean to their businesses at the 1955 Conference for Management on "The Place of the Atom in Your Business." The non-technical conference is scheduled for Thursday, Dec. 15, at Cleveland's Statler Hotel. It is being held in conjunction with the Nuclear Congress and Atomic Exposition.

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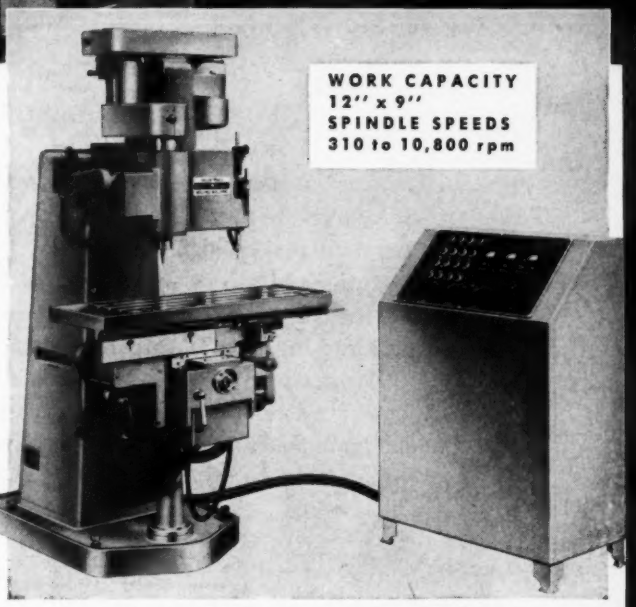

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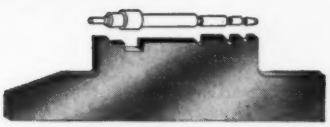

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PART.....Stainless Steel Rotor Shaft for Electric Motor.

OPERATION.....Grind 7 diameters simultaneously.

MACHINE.....No. 2 Cincinnati Centerless Grinder.

BLADE.....Special multiple step Talide-tipped work support blade No. C-4884.

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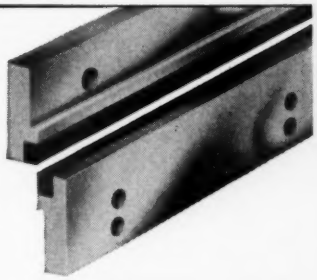
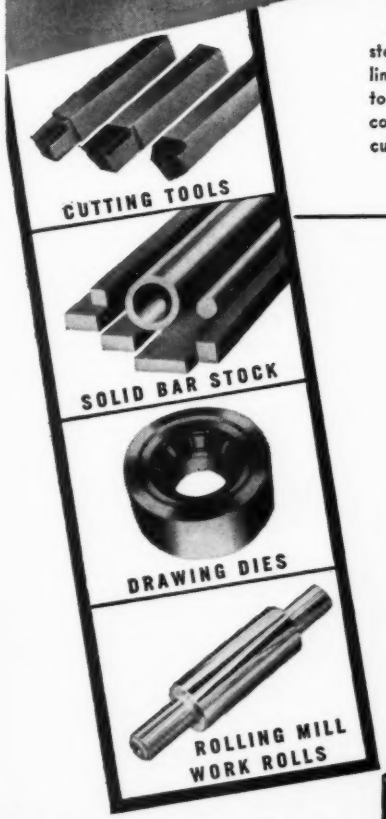
A leading electrical manufacturer shearing .014" silicon steel for transformers has completely equipped their press line with Talide-tipped blades in lengths ranging from 17" to 64". Blade life is averaging 800,000 cuts per grind compared to 10,000 cuts obtained with steel blades, and customer estimates annual savings of $18,000.





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Outstanding production runs like this are possible because of the extra dense and porous-free structure of Talide metal. Try Talide blades and knives on your next shearing or slitting job. They're hard to beat and harder to wear out!

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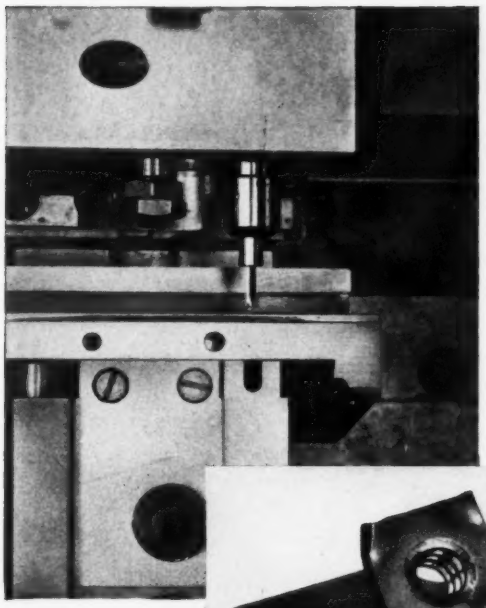
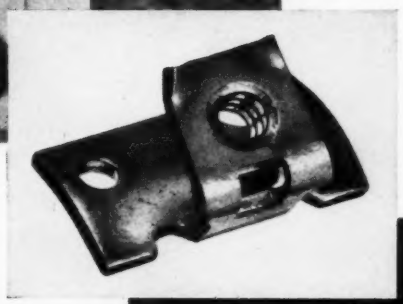
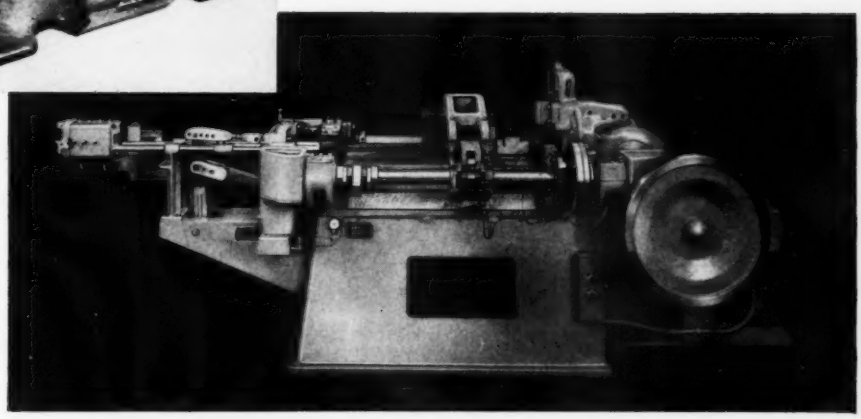




Now! In addition to trimming, piercing, swaging, embossing, blanking and forming . . . .

TAPPING on the U. S. MULTI-SLIDE®



Top: Close-up top view looking down into tapping position on the U. S. Multi-Slide.

Above: Allen-Bradley Coil Terminal produced complete on No. 33 U. S. Multi-Slide, including tapping a 6-32 hole. Shown about three times actual size.

Right: Standard No. 33 U. S. Multi-Slide Machine which is used (with the addition of a tapping head) for the production of the part shown above.

The Allen-Bradley Company of Milwaukee, Wisconsin, manufacturers of quality motor controls, will install in their plant a No. 33 U. S. Multi-Slide Machine equipped with a tapping head to produce the Coil Terminal shown above *complete including the tapping of a 6-32 hole.* The incorporation of tapping in the U. S. Multi-Slide eliminates the need for a secondary operation on this part.

The U. S. Multi-Slide is designed and built for the automatic production of stampings, and any or all of the following operations may be incorporated to produce complete parts at each stroke of the machine: trimming, piercing, swaging, embossing, blanking and forming. Now the possibility of including a tapping operation further increases the versatility of the Multi-Slide, and offers to the user increased potential for cost reduction by eliminating secondary operations and handlings.

Bulletin No. 15-P contains complete specifications. Write for a copy.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

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CIRCLE INFORM-A-GRAM KEY NO. 69

MICROHONING*

PRECISION

in millionths of an inch

MICROHONING is inherently the most accurate of all production methods used for stock removal. Four major characteristics make Microhoning the controlled abrading process—that produces precision in every part.

Low velocity abrading technique
—low speeds (50-250 SFPM) minimize heat and surface stresses.

Sharp cutting abrasive grits at all times
—the self-dressing action provides clean, constant cutting and uniform surface finish.

Self-alignment of tool with bore
—use of the "float" principle . . . either the tool or workpart has universal action . . . automatically aligns tool and bore to correct bore inaccuracies without changing bore location.

Large area of abrasive in constant contact with work surface
—cutting pressure is evenly distributed over the surface by the thousands of minute abrasive grits collectively removing substantial amounts of stock. There is no localized heat to damage the surface or sub-structure of the metal.

An aircraft hydraulic pump block component, made up of cast iron and hardened steel (58-60 Rockwell "C"); nine ported cylinder bores are Microhoned to obtain surfaces which will maintain a "running" seal and which will not gall or "pick-up." From .006″ to .008″ stock is removed from each bore while holding these tolerances:

geometry—.000025″
diameter—.000050″

Steel surface finish is held under 8 microinches; cast iron, under 10 microinches. Bores of both sections are Microhoned in line in the same operation.

For a more complete story on this application, write for CROSS-HATCH, Vol. 7 No. 4.

*MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

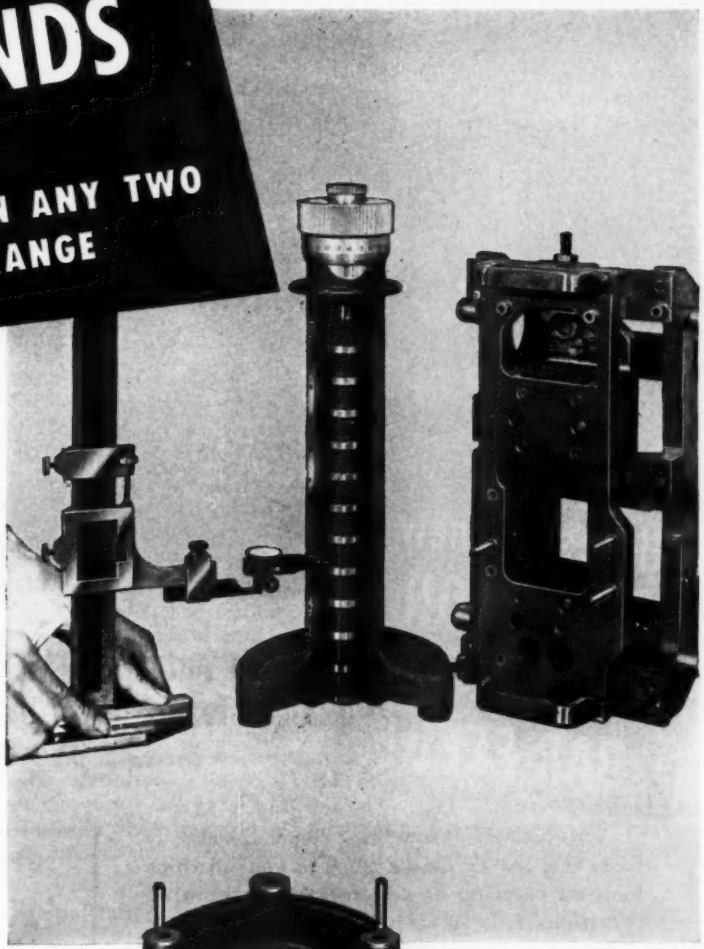
CIRCLE INFORM-A-GRAM KEY NO. 70

SETTING TIME:

10 SECONDS

ACCURACY:

.00005" BETWEEN ANY TWO POINTS IN 12" RANGE



Cadillac PLA-CHEK

SPEEDS ACCURATE INSPECTION from *MINUTES* to *SECONDS*

Designed for easy portability and extreme ruggedness, this 12" Cadillac PLA-CHEK takes little more than 10 seconds to set! Permits surface plate checking and inspections nearly 5 times faster than by ordinary methods.

And, accuracy is assured! Between any 2 points in the 12" range accuracy is guaranteed within .00005".

With a reverse checking plate, a height-gage indicator is easily set for checking the underside of parts. Use of inside micrometers, telescoping and internal cylinder gages gives this gage added versatility. Send coupon TODAY for complete details!

To increase the usefulness of the 12" Cadillac PLA-CHEK Gage, without sacrificing portability, this 6" precision-made riser may be used—upping range to 18".

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Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

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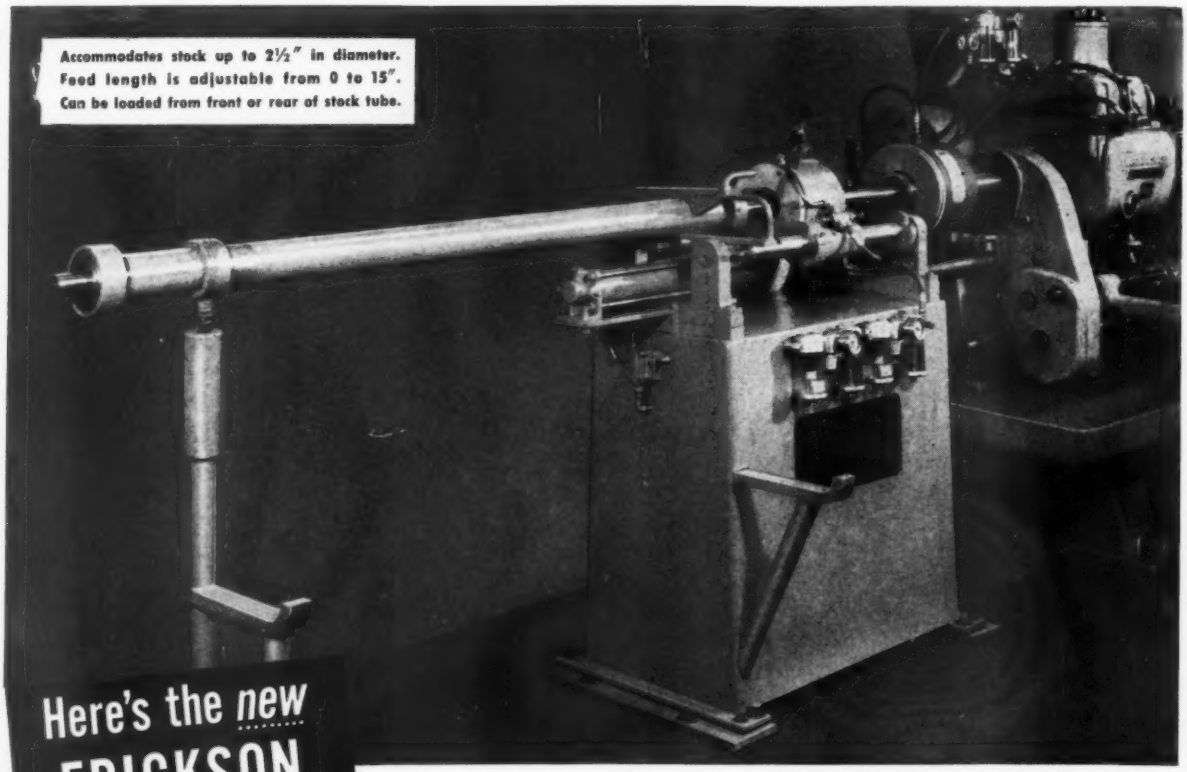

Accommodates stock up to 2½" in diameter.
Feed length is adjustable from 0 to 15".
Can be loaded from front or rear of stock tube.

Here's the *new* ERICKSON PNEUMATIC BAR FEED!

...An Automatic Air Stock Feed and Collet Operating Unit Designed to Operate with any Collet Equipment

• *Increases production* • *Reduces operator fatigue*

THIS NEW ERICKSON Stock Feed automatically feeds bar, hex or tubing stock to your machine tools for rotating or non-rotating machining operations. It is an air-powered, fully automatic unit which is quiet, simple to operate, safe to use, rugged and dependable. It can be used with any type of collet equipment.

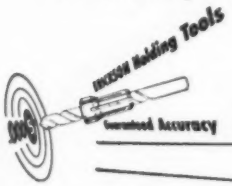
EASE OF OPERATION reduces operator fatigue and speeds set-up cycle time. One valve controls entire operation. At a flick of the valve handle, spindle collet opens and feed chuck advances stock to preset length; feed chuck then opens its jaws. Another flick closes spindle collet on stock and returns feed chuck to its starting position where it closes its jaws on stock to give double grip.

AA-976

OPERATIONAL ADVANTAGES

- Assures positive movement of stock. No dragback of stock on return stroke.
- Adjustable feed chuck jaw pressure eliminates marring or crushing of stock while providing positive grip.
- Permits use of exact size, polished stock.
- Provides double grip on stock to resist "pushback".
- Stock feed is adjustable to suit cycle time and bar size.
- Stock moves with spindle rotating to reduce cycle time.
- No safety controls needed due to basic design.
- Filler tube is supported over its length by ball bearings in stock tube. It rotates with stock to prevent marring, eliminate chatter.
- Rugged welded base construction rigidly supports feed chuck, dampens vibration, reduces whip, guaranteeing smoother finishes, quiet operation.

For complete information on the new Erickson Pneumatic Bar Feed, send for your copy of Circular K-2 today!



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EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

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atomics--here and now

Whatever may be attained in the generation and distribution of electric power by utility plants "fired" by nuclear reactors will be rather undramatic as far as the consumer of that power is concerned. Regardless of the power source — hydro-electric, coal or oil-fired steam, or nuclear fission heat exchange — we will simply flip the same switches in our homes and shops in order to get the same "juice".

The big battle, going on behind the scenes, is that being waged by researchers, scientists, and engineers against today's incompatible costs of converting nuclear energy to merchandiseable kilowatt hours of electricity.

That the battle will be won is, by all tenets of American enterprise, a foregone conclusion. Already, many, many millions of dollars in risk capital have been enlisted in the campaign. American ingenuity and free enterprise have calculated and accepted the technical and economic risks; the long-pull program is underway and gaining momentum.

Much closer, however, to our homes, jobs, and shops are many other developments in and applications of atomic energy that prevail today.

In our editorial last month we painted a picture of the next-to-unbelievable progress made in various fields of endeavor in any 25-year period of easy recollection. The point was made that if, at the beginning of such a period, you had been confronted with a prediction of those things to come you would have been hard put to muster sufficient credence to accept it by half.

This month we will settle for a 10-year period starting with Hiroshima.

Nagasaki, ten years, and thousands of Geiger counters later, what do we find?

What would you have said, back in the dark ages of 10 years ago, if you had been told you would be able, in December 1955, to walk into Cleveland's Public Auditorium and find a Nuclear Engineering and Science Congress in session, sponsored by 26 engineering and scientific societies, and backstopped by an Atomic Exposition of some 160 exhibitors?

So would we. Nuts — just plain nuts. Anyone with half a brain cell knew, and feared, that all atomic fission could ever amount to would be to wipe cities off the face of the earth.

Elsewhere in this issue you will find news of the Nuclear Congress program and the list of industrial, governmental, educational, domestic and foreign exhibitors who will display their wares — today's tools, methods, equipment, and techniques for putting atomic energy to work for you. Fifty technical sessions and conferences will spawn hundreds of papers on every phase of nuclear development. In the interest of "atoms for peace" many of the papers have been declassified by the Atomic Energy Commission expressly for the Congress.

As you visit the exhibits, watch the demonstrations, and take in the lectures, there can be but one reaction: Where have I been all this time?

* * *

So much for the facts — now for the fancy. In our two — November and December — editorials we have tried to show how quickly and inevitably technological progress converts fancy to facts — how yesterday's science fiction becomes today's reference text. Therefore, why not try a little predicting, yourself?

Write us a letter predicting what, in your own specific line of work, will be an outstanding development and/or accomplishment ten years from now. To the writers of the 25 most interesting letters which we can print under "Things to Come" we will send $10.00 from our editorial budget. To all who come through with a prediction, whether published or not, we will send one of TOOLING & PRODUCTION's better mousetraps.

There are no rules or regulations except to get your prediction to us by Thursday, January 5th, 1956. The contest is open to all who read this. Your own imagination is your only hurdle. As a refresher course in predicting you might again read Jules Verne's "From the Earth to the Moon". You probably laughed the first time you read it. Today, there's a line forming at the transportation desk. Catch on?

E. Willard Pennington

editor

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Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

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Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.

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The exact methods of producing various types of bends in a wide range of materials are illustrated, step by step, with over 90 diagrams and charts together with valuable tooling suggestions.
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— FEATURES —

PLASTICS TOOLING. "Plastics in Body Tooling" by Lewis F. Bogart, The Marblette Corp. 10
The use of plastics in tooling has rapidly increased due to many of the limitations of materials having been eliminated through research. Examples of the plastics used in body engineering is discussed by the author.

ATOMIC ENERGY. "Cleveland Looks at The Atom and Industry" 77
This is a report on a survey made with reference to the present and future utilization of atomic energy for power and other uses in Cleveland manufacturing plants.

ATOMIC ENGINES. "Making Atomic Equipment" 79
Extreme precision is required at every step in the building of atomic engines at Westinghouse's submarine engine project. Some of the procedures followed to meet the requirements are described.

CEMENTED OXIDE. "New Cemented Oxide Tools Go to Work at 1000 SFPM" 80
Cemented oxide, a new cutting tool material, has shown by initial spot tests, that it may be used with good success for finishing operations at top speed ranges of current machines in use. Its performance is better at speeds of 1000 sfpm and over.

DIEING MACHINES. "One Piece or a Million Can be Produced Economically by Die Machines & Versatile Tooling" by William S. Renier, Henry & Wright 81
Industry has turned to machines that do more than one job, rapidly and economically, as an important factor in unit costs. The author discusses the experience of several companies who have raised their production level by the judicious selection of multiple purpose machines.

PRECISION GRINDERS. "How to Grind to Ten Millionths of an Inch" 83
Manufacturing roller bearings in commercial quantities, accurate to within seventy-five millionths of an inch, requires machines and gages of extreme accuracy. A bearing parts grinder is described capable of accuracies greater than ten millionths of an inch.

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FEEDING EQUIPMENT. "The Design and Application of Automatic Feeding Equipment for Machine Tools and Presses" by David E. Fyffe and Hewitt H. Young, Purdue University .. 85

Automatically feeding production equipment has become standard practice in the metalworking field. Since information on selecting the proper type of feeder is somewhat scattered, the author offers a guide for selecting feeders for specific applications.

TOOLING MANUALS. "Streamlined Indexing of Tooling Manuals" by Russel Coberth, The Glenn L. Martin Co. 95

A simple, flexible, indexing method for preparing tooling manuals is desirable in plants of any size. The method followed at the Glenn L. Martin plant is outlined by Mr. Colberth.

FRICTION. "Friction in the Processing of Metals" by Antoni Niedzwiedzki, Machining Consultant .. 98

This is a report in which the author shows to what extent chip formation and other metal processing phenomenon can be explained in terms of friction.

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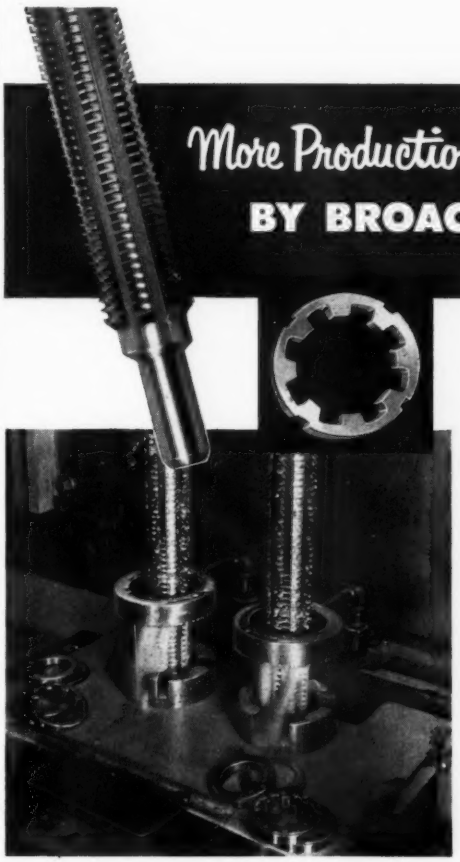
More Production, More Profit
BY BROACHING . . .



Internal broaching of a cam ring. Note the complexity of the ring design. The steel is soft and tends to tear, yet this Continental Broach sizes the I.D. and cuts 8 splines 5/16" deep *in one pass.*

REMOVE STOCK TO PRECISION LIMITS—FAST . . . ROUGH AND FINISH IN ONE PASS!

The scope of Broaching has broadened in recent years. Many broaching operations do precision work in far less time than other metal-cutting methods.

Continental Engineers have for years been designing all types of cutting tools and broaches. They can recommend without bias your most economical way to do the work.

For facts about increasing your production by broaching, call in your local Ex-Cell-O representative —or write Continental in Detroit for Cutting Tool Catalog.

CTW

64-37 Continental

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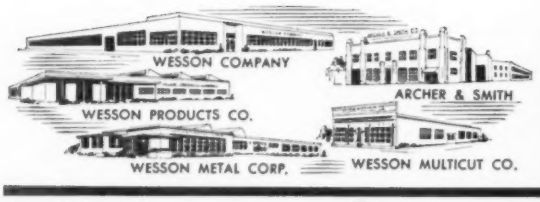


carbide NEWS

26 Outperforms Other Carbides 8:1

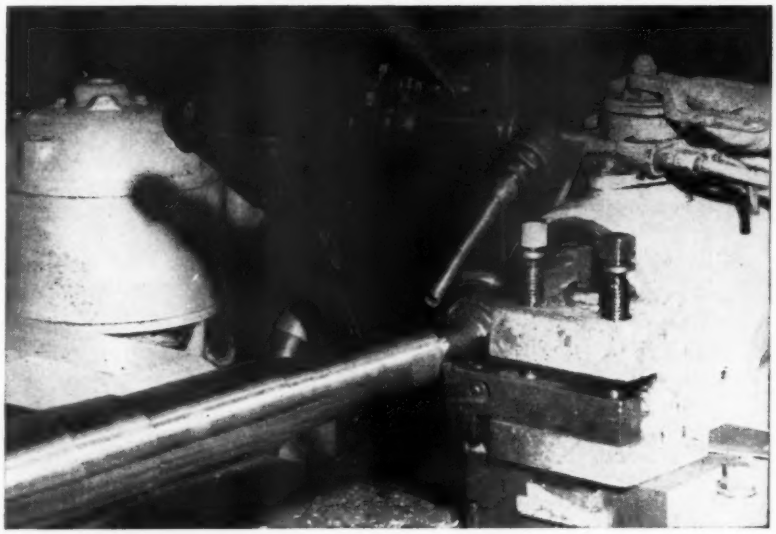
Boosts sprocket shaft output from 15 to 120 pieces per grind

In a series of production comparison tests, Grade 26 again came out on top—this time in machining forged steel (Rockwell 44) tractor sprocket shafts at a large midwestern tractor company.

With Wessonmetal 26, output averaged 120 pieces per grind as compared with 15 pieces per grind for all other steel cutting grades tested.

The operation is performed on a new 20" Monarch Air Gage Tracer lathe and consists of finish turning the shaft diameter, forming radii and chamfers, and rough turning all other diameters. Length of travel in the cut is 18¼"; speed 375 sfpm; feed range from .009 to .012". Average depth of cut for all diameters is ¼-inch.

Primary reason for the big increase in life achieved with Wessonmetal 26 is its ability to stand up under widely varying conditions. Inserts made of other carbides shattered or broke after 12 to 15 pieces on one cutting edge and could not be indexed. This trouble was eliminated with Grade 26, which averaged 20 pieces per edge and could be indexed to give a total of 120 pieces per grind.



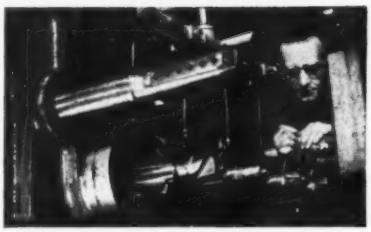
Worthy of note also is that the performance of Wessonmetal 26 (a "nearly universal" steel cutting grade) was achieved in comparison even with carbides of a specialized nature specifically selected for this operation.

New Film Points Way To Better Tooling

One of the most dramatic technical sound films yet produced is now released by the Wesson Company for showings to technical and shop groups.

Built around the development of tooling for an actual job—the machining of tractor track links—the 16 mm. technicolor sound film—which took two years to complete—records the *failures* as well as the successes achieved. The trials and tribulations encountered will remind many of their own experiences.

Entitled "Tools of Abundance," the film tells how a large manufacturing committee working with Wesson tool engineers carried a specific job through to completion. It is the story of how cooperation helps to develop and improve American manufacturing methods.



This story of teamwork—supplemented by about a dozen other general machining and high production operations in the film—provides a rational approach to solving other difficult tooling problems. For a showing to YOUR company, write for the film on your company letterhead. A Wesson man will bring it to you.

tools Wesson carbide Wessonmetal

WESSON COMPANY
DEPT. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

Tool Hints

If you have an idea that you would like to get better tool life on a job than you are getting, do these things and you may find you were right:

1. Check for vibration and chatter and eliminate all you can. Both are deadly to tool life.

2. Check whether the rake angles are correctly ground. There is a best combination for any job.

3. Check whether you have the ideal combination of speed and feed.

4. Check whether tools are changed before they get too dull. Dull tools wear faster than sharp ones. Keeping them at work is false economy.

5. Check tool after each sharpening against the tool PRINT. This is excellent insurance.

None of these suggestions are new. But they are still keys to better tool performance.

(P.S.—A sixth method is to call in a Wesson man)

Cleveland Looks at

THE ATOM AND INDUSTRY

ALTHOUGH WIDESPREAD USE of atomic energy is still in the future, members of Industry today have a three-fold share in atomic developments:

1. As users of radioisotopes for research, measuring and gaging, and inspection.
2. As suppliers of nuclear equipment and components to the Atomic Energy Commission and private users of atomic energy.
3. As recipients of data and techniques developed in atomic research.

Actual utilization of the atom's energy as an industrial power source is still many years in the future. Current atomic power plant projects offer technical information necessary for future power installations, however. "Ten years will tell," a Cleveland Illuminating Co. official predicts, while C. C. Brumbaugh, Research and Development Director at Diamond Alkali, warns that atomic power needs 10 to 20 years for economical development.

Cleveland's private industry views the application of atomic developments the same way as industry views all scientific developments. While atomic energy holds considerable potential as a power source, as a research tool, and as a production instrument, its possibilities must be more thoroughly investigated and its use must become more economical before it will become acceptable on a broad scale.

Many of Cleveland's industries have obtained AEC clearances and are now sponsoring private research programs to insure against "missing the boat" when feasible applications of nuclear energy are developed.

Huge corporations such as Republic Steel, Standard Oil of Ohio, and General Electric have whole research teams working full-time on atomic energy. Some smaller manufacturers employ one-man research "teams", while others enlist the aid of outside engineers and consultants.

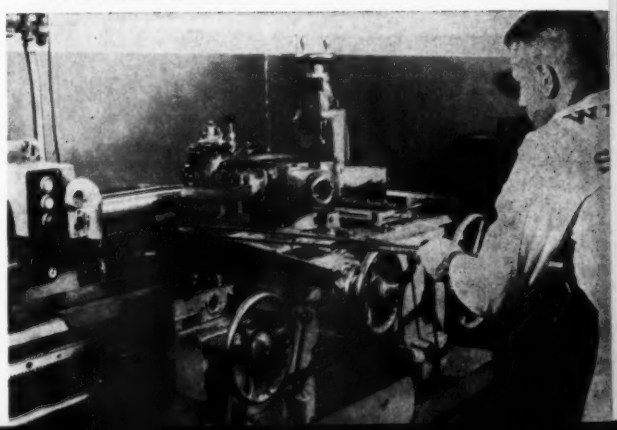
The potential value of atomic or nuclear energy as an industrial tool is evidenced by its current, though limited, uses.

Warner & Swasey Co., machine tool and special machinery builder, has already employed radioactive substances in testing the behavior of carbide cutting tools. The company has had AEC clearances for about 18 months and plans to continue utilizing atomic energy for a more thorough research program on metal cutting techniques.

Standard Oil of Ohio credits radioactive materials with helping to put the company's new, high-powered "Boron" gasoline on the market. With test engine parts irradiated, wear characteristics of various gasoline formulas developed by Sohio researchers were accurately measured with radioactivity detection instruments. The final "Boron" formula is the result of these extensive tests.

The atom's power to impart physical and chemical changes in materials is evidenced in the irradiated polyethylene plastics produced by The American Agile Co. Sub-atomic particles with high energy content bombard the polyethylene to change its molecular strength and improve such properties as heat resistance, tensile strength, chemical and solvent resistance, and stress cracking. Instead of using radioactive materials at American Agile, however, a Van de Graaff generator produces the

A Warner & Swasey technician is shown removing the small pan used to catch the chip sample during a cutting test with a radioactive carbide tool. Although the radiation intensity of the chips contained in the pan is extremely low and well within safe limits, a long handled tool is used to move the pan away from the high radiation intensity area surrounding the cutting tool.



Using a precision rate counter, the radiation intensity of an exact 50-gram chip sample is measured and recorded during a tool wear test. The sample is in the test tube protruding from the well counter located on the table next to the rate meter.

Beta rays that transform the plastic. This method is faster and more powerful than the use of available radioisotopes.

The difficulty in obtaining, shipping, and storing powerful enough isotopes are additional reasons for the company's use of a Van de Graaff accelerator. With present techniques, AEC clearances are not needed by the company. Agile's Research Director predicts that in 10 years, however, radioisotopes will be used.

They're Saying . . .

"We must get a nuclear power plant working to see its value and how it really works. Then we must seriously consider its building costs and reliability."

—A. A. Casey, Vice President, Power Production & Engineering, The Illuminating Co., Cleveland

"With our present research on atomic energy we are obtaining the instrumentation, clearances, and experience for future developments."

—Robert Hook, Chief Metallurgist, Warner & Swasey Co.

"Our company has one man studying the whole situation to keep us informed on nuclear developments. We don't want to be left out . . . on inspection procedures, on chances to sell our products, or on chances to use atomic power."

—John D. Selim, Development Coordinator, Weatherhead Co.

"The long range effect (of atomic energy) on machine tool manufacturers will be big. For example, the conversion of energy to useful work equals the conversion of heat. Machinery is involved in doing this."

—Frank Zagar, President, Zagar Tool Co.

"The electronics industry is most closely allied to nuclear and atomic activity. Therefore, we must continue to grow beyond any possible conjectures. Thus, atomic energy offers the electronics industry limitless possibilities."

—A. N. Haas, President, Bud Radio, Inc.

"The public is lead to think of technology as a miracle worker. On an industrial basis, we must consider the economics of atomic developments too. The main near-term use of atomic energy is to generate electric power, but the costs of a power plant are so high that only the big-big can afford it . . . It will take a minimum of five years before the industrial use of isotopes is widespread."

—C. C. Brumbaugh, Director of Research & Development, Diamond Alkali Corp.

Realizing the extremely accurate testing possibilities the atom offers, Leece-Neville Co. has asked its suppliers to conduct wear rate studies on some of the rare metal contacts L-N purchases for electrical equipment the company manufactures. Wear rates representing six months of service are available in a few days when atomic energy developments are utilized.

Suppliers of atomic equipment and component parts, serving both government and private atomic installations, have already felt some effects of the "atomic age."

Products like the instruments, fittings, filters, and controls manufactured by Cleveland firms for nuclear projects do not, for the most part, constitute new product lines. Rather, the manufacturers have adapted existing products for the nuclear field.

"Basically," commented C. H. Bernard, nuclear specialist at Bailey Meter Co., "it meant changing designs and materials of our regular line in instrumentation." This business is not a major portion of their output at the present time but other Cleveland suppliers have felt the impact of the atom to a greater degree. Atomic developments have meant a one-third increase in physical facilities for Bud Radio, Inc.

One Cleveland instrument manufacturer reports the following uses of his firm's products for determining radiation: Measuring alloy steel wear rates for a steel corporation; gaging plastic sheet thicknesses for a plastic fabricator; measuring the amounts of radiation absorbed by workers at a research center; and detecting amounts of petroleum in storage and fuel lines for a refinery. Research on food sterilization and preservation, in addition to government defense projects and power projects, also utilize Cleveland-made instrumentation.

Increased use of nuclear energy for power and other uses will mean further expansion for both large and small equipment manufacturers.

All Industry has benefitted from the close tolerance, high quality demands of the Atomic Energy Commission in procuring equipment. The "quality consciousness" resulting from AEC orders will mean better products in even non-atomic fields.

Still another development resulting from atomic research must be mentioned. AEC-sponsored research led to the industrial availability of new materials such as titanium and zirconium. These metals, according to Lincoln Electric's Research Director, George Landis, open additional avenues for Industry.

MAKING ATOMIC EQUIPMENT

Super-fine finishes of curved surfaces, such as those for radial sleeve bearing journal bushings, are checked with a profilometer to measure the finish of the journal bushing fit on the rotor shaft of the "canned motor-pump" built at the Westinghouse Atomic Equipment Department.

WATCHMAKING PRECISION is demanded of every operation at Westinghouse's Atomic Equipment Department plant in producing "canned motor-pumps" for the AEC's atomic submarine engine project.

The pumps are used to circulate liquid coolant in a hermetically sealed atomic reactor system.

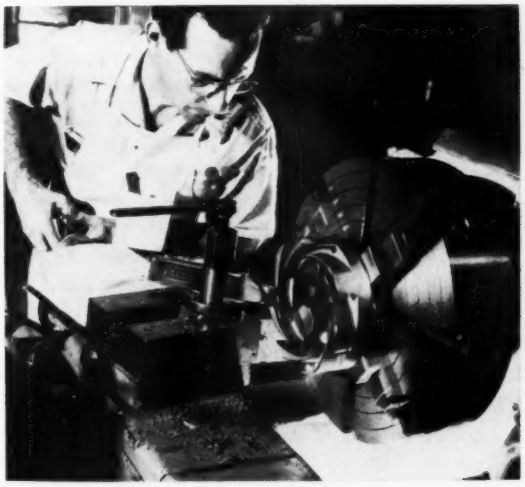
The motor-pump's impeller and electrically driven motor are both encased within a single pressure vessel, and thus the fluid being pumped circulates throughout the drive motor; its bearings, rotor, and sealed stator. The stator windings are protected from "hot" fluid by jacketing the ends and outside diameter in stainless steel and then lining the inner bore with a cylinder or "can" of thin nickel alloy sheet, welded leak tight at each end.

Surface finish requirements range from 1 to 5 micro-inches and dimensions are held to 0.0001". All structural raw material used in the pumps is of corrosion resistant nickel alloy and each shipment must be accompanied by a certified chemical and physical analysis.

Canned motor-pumps derive their name from the nickel alloy cylinder that lines the bore of the stator and that surrounds the rotor core. A Westinghouse mechanic is shown inserting a nickel alloy liner into the stator. The next step is to weld the liner to the stator shell flange and end ring.

Once the raw materials are put into production, inspections and tests are almost as numerous as manufacturing operations. Dye penetrant and magnetic particle inspection methods test for surface flaws, X-Ray and ultrasonic methods for internal flaws. Where fine and superfine finishes are specified, profilometers and optical flats and monochromatic light sources are used. Both gas and liquid pressure tests make certain that the pumps are sealed properly.

A machinist takes a finish cut in machining the top contour of a diffuser for the centrifugal pump of the canned motor-pump.



Enlarged view of chip produced by cemented oxide cutting 4340 steel, 260 Brinell at 300 sfpm. Finish is good, but chip indicates more evaluation of tool geometry is required for cutting this type of material.

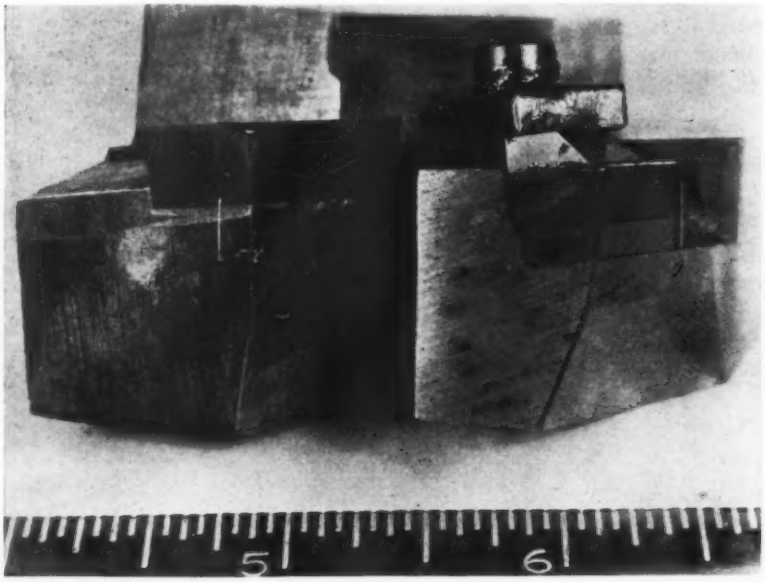
New Cemented Oxide Tools Go to Work at 1000 sfpm

THE EXPERIMENTAL cemented oxide tool material developed by Carboloy Department of General Electric Company, Detroit, will be available to users on a limited basis by January, 1956.

According to Carboloy engineers, initial spot tests of the new cemented oxide material — so called to distinguish it from typical ceramics — indicated that the material may be used with good success for finishing operations at top speed ranges of machines currently in use. Its performance, however, is considerably better at speeds of 1000 sfpm and over.

Although no coolant is required, the material may be used with coolants if heat deformation of the work is a factor. The tool material does not heat up, and is generally cool to the touch following a machining operation. Most of the heat is transferred to the chip and some to the work.

. . . *Continued on page 97*



This close-up shows wear on carbide tool, left, and on cemented oxide tool tip. Carbide tool made only a half cut on 7' turbine wheel hub, while oxide tip was used for two additional cuts — one of them on the face of the wheel's outside diameter. Wear life of cemented oxide may be as high as 25 to 1 compared to carbide.

One Piece or a Million Can Be Produced Economically by

DIEING MACHINE AND VERSATILE TOOLING

by William S. Renier

HENRY & WRIGHT
Division Emhart Mfg. Co.
Hartford, Conn.

WITH CONTINUALLY climbing costs a major concern, industry has turned to machines that do more than one job, rapidly and economically, as an important factor in reducing unit costs.

In the stampings field in particular, the forward-looking company has at its disposal many methods of reducing costs which are logical extensions of the normal operation. Progressive dies that eliminate between-stages handling, assembly attachments, and special feeds all contribute to lowering production costs.

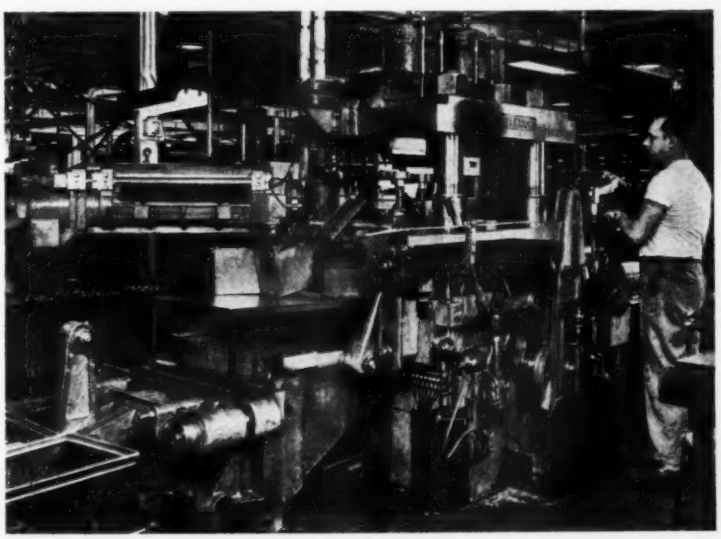
Regardless of company size, maximum value and flexibility can be obtained from equipment that is designed to meet today's needs. Many press manufacturers are equipped to engineer presses for specific tasks which effect economies by reducing handling, downtime, and by stepping-up production rates.

At the Hart & Cooley Mfg. Co., Holland, Mich., producers of warm air heating and air conditioning diffusers, registers and grilles, two automatic dieing machines virtually eliminated a complete press room. The two machines freed about 15 conventional presses of varying sizes for other work by replacing as many as five individual operations.

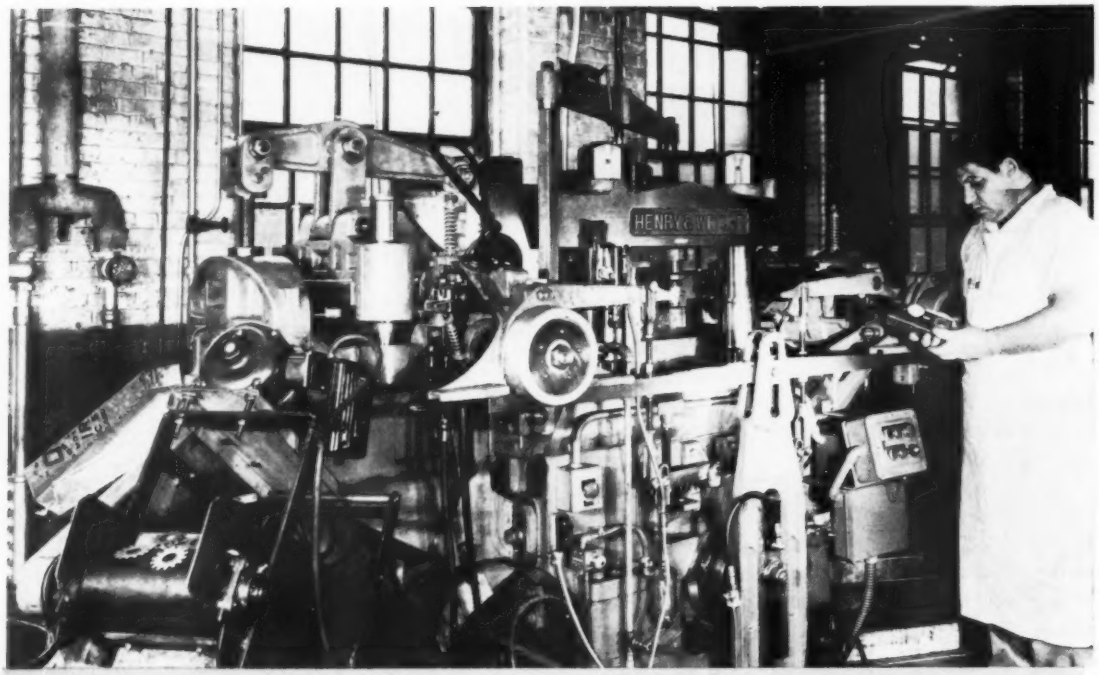
Hart & Cooley runs their machines from 16 to 24 hours daily, from five to six days a week. They found that increased production rate, greater accuracy and greatly increased die life contributed greatly to production economies.

The flat spring department of Wallace-Barnes, Division of Associated Spring Corp., Bristol, Conn., uses automatic dieing machines to handle orders ranging from a single piece into the millions. Simplicity of die change, high production speed, and lack of downtime has enabled this company to remain a leader in a highly competitive field.

Dieing machines have been used in tasks ranging from delicate, filigree-type work to heavy automotive transmission housings. The automotive industry turns out transmission housings at a rate of 60 per minute, while spark plug terminals are made at a rate of 500 a minute, or enough for 750 eight-cylinder cars every hour. Hydraulic brake cylinders and caps, 7½" wide, come off Henry & Wright machines at 120 per minute.



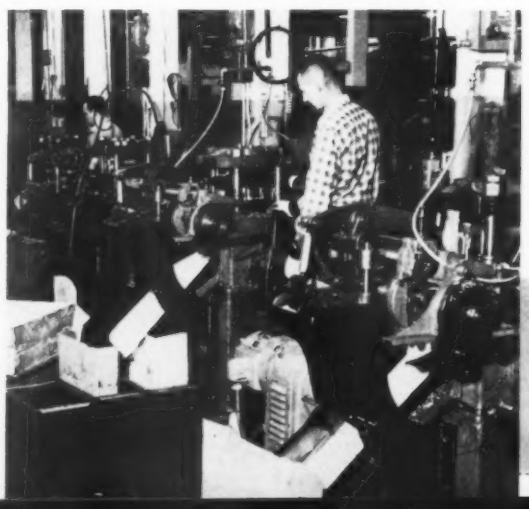
One of two dieing machines at Hart & Cooley Mfg. Co., Holland, Mich., this 200-tonner is used to turn out components for the company's line of warm air heating and air conditioning equipment. Scrap cutter at left has been swung out of position because it is not needed on this particular run.



Two or three die changes a day are routine for this dieing machine in the flat spring department of Wallace-Barnes, Division of Associated Spring Corp., Bristol, Conn. Careful selection of equipment permits this company to remain competitive in a price-conscious field.

Makers of a broad line of household and general hardware, H. L. Judd Division of the Stanley Works, Wallingford, Conn., has attained a high degree of flexibility by requiring three basic elements in its stamping equipment: suitability for progressive dies, high speed, and ease of die change.

The first machine in this company's battery of 13 dieing machines dates back to 1919; four were purchased during the past two years. Judd produces orders ranging from 1,000 pieces to 2,000,000. They have found the combination of high speed progressive dieing and easy die change gives the flexibility needed to handle small orders in a hurry and, at the same time, to fill routine million-part orders.



At the H. L. Judd Division of the Stanley Works, Wallingford, Conn., these machines, part of a battery of 13 Henry & Wright automatic dieing machines, produce a wide range of parts and completed units for the company's broad line household and general hardware. Flexibility in stamping equipment is a must here since orders range from 1,000 pcs to 2,000,000.

Other companies have used assembly stages on the die or special assembly fixtures to obtain "free" assembly operations. Flexibility, speed and accuracy, coupled with die life, spell a winning combination for many companies.

With the ability of modern presses to handle wider and heavier gauge steel, stampings have been used to produce parts that formerly were made by castings or forgings. The ability of the progressive die to produce a part that needs a minimum of additional machining has greatly contributed to production economies.

For virtually every stamping job there is a machine that can do the work most efficiently and economically. Sometimes, if volume and length of run is long enough, it is sufficient to consider a machine strictly on the basis of a single application. Most users, however, must consider the equipment's adaptability to other jobs.

Many companies today set up basic requirements for all stamping equipment and then select the machine on the basis of it not only meeting those requirements, but the added values, such as longer die life and inherent accuracy, in making their final choice.

How to Grind to

TEN MILLIONTHS OF AN INCH

THE TIMKEN Roller Bearing Company manufactures, in commercial quantities tapered roller bearings accurate to within seventy-five millionths of an inch. Such incredible accuracy can only be accomplished with equally incredible accuracies in the machines and gages used to produce these bearings. Here's how Timken Company engineers and American machine tool building experts developed a grinder capable of accuracies greater than ten millionths of an inch.

The precision grinding machine requires a sturdy base that adequately supports the machine and keeps it stable and immobile. All of the grinding machine's parts must fall within the base of the machine. The O.D. grinding machine is leveled with a precision level. The internal grinding machine has a built-in level.

The wheel head slide on the I.D. grinder is force-lubricated. All moving parts of the I.D. wheel head must be carefully machined and all fits must be metal-to-metal with no press, yet no looseness. The work head spindle on the I.D. grinder is further checked by sweeping the face of the chuck with an indicator. A hole is ground on the chuck and this is also swept with an indicator to assure the work head and wheel head spindles are the proper height in relation to each other.

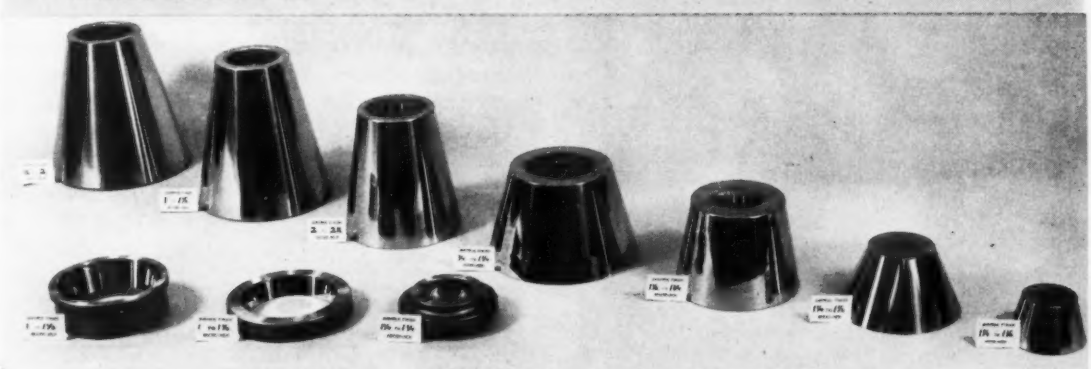
Work head pivots on the face of the chuck make a finer adjustment of the straight and taper alignment possible. The face of the magnetic chuck and the work placed on the chuck must be absolutely flat. If either the face of the work or the chuck is not flat, they will flatten out against each other. If a hole in the workpiece is being ground under such circumstances it would be true while being held by the magnetic chuck. After the magnetism in the chuck is released, however, if either the workpiece or the chuck face were not flat, they would spring back to their original shape. The hole in the workpiece then would not be round nor straight. Meticulous precaution with wheel and work head accuracies pays off in improved straightness in the workpiece.

The belt used on the I.D. grinder work head must be uniform and made of a seamless fabric to eliminate vibration. Tension on the wheel head belt must be constant.

Table ways on the O.D. grinder are lapped and also force-lubricated. The wheel head on the O.D. grinding machine is driven by a carefully balanced, direct current, variable speed, one-horsepower motor. The work head on the internal grinding machine is driven by a variable speed, hydraulic motor and the wheel head is driven by an alternating current, one-horsepower motor. Legs on the motors are machined so that they set absolutely flat. The motor pulley must run true and be carefully balanced with the motor.

The direct current motors were used for two purposes: (1) to reduce pulsating that you have in an alternating current motor and (2) to be

The surface finishes on these ten precision gages range from ¾ micro-inch to 2½ micro-inches. There is no variation of more than ½ micro-inch over the surface of any one gage. Only by holding the gage surface variations to such close limits can the gages be produced to compatible size accuracies of ten millionths of an inch or less.



The controls effected in Timken's master gage grinding department and adjacent gage measuring laboratory are far more ordinary. Not only is the temperature held between 68° and 70°F, with a 45% humidity, but the floor of the grinding room is a solid concrete slab reinforced with steel and 24" to 36" thick. To minimize vibration the walls and girders are independent of the grinding room floor.

able to vary the speed. A variable speed motor is desirable for the utmost accuracy because if the grinding wheel is not grinding properly, the speed can be increased or decreased to afford better operating conditions.

The grinding wheel on the O.D. grinder is dressed at a higher speed than is used when grinding. The motor should be in perfect balance, and frequent balance checks of the motor should be made.

Centers on the grinder should be in line in all directions in order to get true roundness. It is possible to get a good grind only when centers are absolutely in line. If centers are not in line, the work usually becomes concave. Centers on the machine have to be adjusted so that just enough pressure is exerted to take up all motion but light enough to avoid any bending of the workpiece.

The tail stock center must fit closely yet must be free enough to move.

To assure the maximum grinding machine accuracy, the wheel center must be exactly the same height as the machine's centers.

The O.D. machine is equipped with accumulators to dampen the pulse from the hydraulic system. Engineers accomplished this by installing accumulators which maintain a constant pressure in the hydraulic system.

The O.D. machines are equipped with a table tarry which causes the grinding wheel to pause at the end of the workpiece before tripping and reversing its travel. The tarry installation aids the operator in obtaining straightness on the workpiece being ground.

The grinding wheel should cut free and must avoid sending free particles from the wheel to the workpiece. The wheel is dressed very carefully, with sharp corners rounded off by hand and all loose grits removed from the wheel.

The diamond holder, used in the dressing operation, is very sturdy and as nearly free of vibration as possible. The sharp conical point diamond must be on the center of the wheel.

Pulleys on the machine must run absolutely true and in perfect balance. Pulleys should be accurate to between .0003" to .0005".

The floor of the precision grinding room at The Timken Roller Bearing Company is a solid concrete slab reinforced with steel and 24" to 36" thick. The walls and girders are detached from the grinding room floor to minimize vibration.

To assure constant working and measuring standards, temperature in the master gage grinding department and the adjacent gage measuring laboratory is maintained between 68° and 70° F., while humidity is kept at 45%.

The rewards for the painstaking precision built into The Timken Roller Bearing Company's precision grinders have been substantial.

The Timken Company has invested hundreds of thousands of dollars in master gages for the obvious purpose of producing an extremely accurate product. With the increased grinding accuracy has come even more accurate gages. The life of gages ground on the new precision grinders is much greater. Fewer gages are now required.

Because of the previous short life of gages, the tool room was constantly busy making new gages. This often proved to be a production bottleneck. With the installation of the precision grinding machines the production bottleneck caused by too few accurate gages has been totally eliminated.

Most important, of course, is the increased accuracy and quality of Timken tapered roller bearings.

The new precision grinders at The Timken Roller Bearing Company are phenomenal, even in a company where tolerances of ten millionths of an inch have become commonplace.

The Design and Application of AUTOMATIC FEEDING EQUIPMENT for Machine Tools and Presses

*by David E. Fyffe and Hewitt H Young**
PURDUE UNIVERSITY
Lafayette, Indiana

RECENT YEARS have seen an increasing interest in automatic production and in the automatic feeding of production equipment. In their constant efforts to increase production and to lower costs, management and engineers have turned to this area and its vast potential savings. Some of the advantages claimed for automatic machine loading are:

1. Increased rate of production
2. Lower direct labor costs
3. Lower capital expenditure for increased production
4. Easier scheduling of production
5. Increased tool life
6. Greater safety

It has become apparent to those faced with the selection of automatic feeding devices, however, that information concerning such equipment is widely scattered and in many cases outdated. This article is therefore offered as a guide in the selection of automatic feeders for specific applications.

The enclosed information has been obtained from current articles in the technical journals, from various manufacturers' catalogs, from personal observations of the authors.

The selection of an infeed mechanism for a particular feeding requirement depends upon the machine to be fed, the physical characteristics of the part or material, and the production rate required. Generally speaking, it is possible to automatically feed practically every common type of machine tool and many types of presses. Many of the special machines, of course, have feeding mechanisms built-in to the machine itself.

We may classify most of the currently available feeding equipment into the following six categories, which will be individually discussed:

1. Bar Feed Mechanisms
2. Mechanical Transfer Arms
3. Hopper Feeders
4. Magazine Feeds
5. Dial Feeds and Indexing Tables
6. Roll Feeds and Grip Feeds

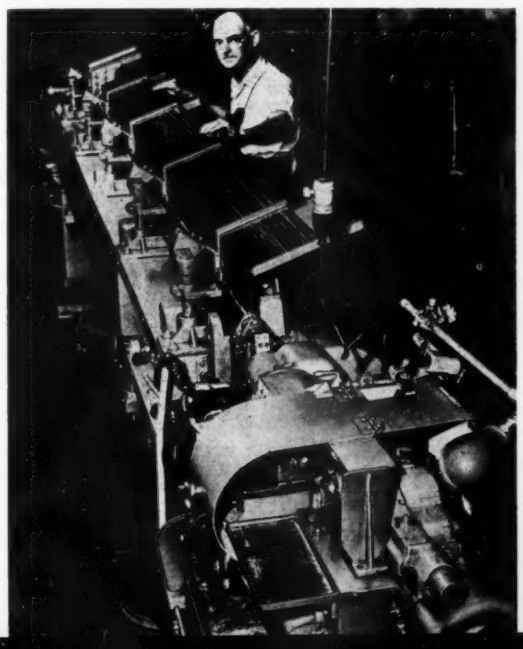
*This article is a condensation of a Master of Science thesis prepared by Mr. Fyffe as a graduate student working under Prof. Young in the Department of Industrial Engineering, Purdue University. Mr. Fyffe is now employed on the "Manufacturing" Training Program of the General Electric Company at DeKalb, Illinois.

Bar Feed Mechanisms

There are essentially two types of bar feeds; namely, pneumatic—or hydraulic—bar feeds and automatic rod magazines. The former is a completely automatic and self-contained feed mechanism used to feed rod, bar, or tube stock into machines which provide a positive stop for limiting the length of feed. This type is primarily used on or with hand screw machines, single-spindle automatics, automatic lathes, and turret lathes. It can, however, be used with saws, cut-off machines, and punch presses. Essentially, operation of the pneumatic bar feed consists of an air-actuated piston in a feeder tube which pushes the bar stock through the open headstock collet and against a turret or swing stop. Round, square, or hex stock, in any material from ⅛″ to about 3″, may be fed in lengths of from 6′ to 20′.

Fig. 1. Automatic magazine-loading pneumatic bar feed eliminates the loss of machine time whenever the end of a bar is reached.

Courtesy Lipe-Rollway Corp.



Courtesy Magnaflux Corp.

Fig. 2. The Lodac press feeder — a self-contained automatic feeder that has arms at right angles. The part is placed in the die by one arm and removed by the other. The feeder controls the press, the positioning device on the right, and the turnover mechanism at the left.

These feeds are relatively inexpensive, cost little to operate (10 psi air), and require a minimum of maintenance. Pneumatic bar feeds generally are loaded manually, although certain types permit entirely automatic machine operation with the inclusion of an automatic magazine.

Automatic rod magazines can be used to restock automatics, cut-off machines, etc., without operator attention. These magazines hold a supply of rod or bar stock and have a feeding mechanism for automatically taking a new rod from the magazine and advancing it into the machine . . . until it is in position for squaring-off the bar end. The magazine may be mechanically or electrically controlled and starts to function when the rear end of the rod being machined leaves the magazine.

Mechanical Transfer Arms

These are designed to duplicate the motions of a human operator. They are constructed with a system of levers designed to grasp the workpiece, pick it up, transport it, position and release it. Air cylinders are most commonly used as the muscles for these machines, but levers actuated by machine movements and/or cam actuating devices have been used for specific applications. Power is required for gripping and for any movement of the arm.

Press work provides the best field of application for mechanical arms. However, they may also be employed with brakes, shears, forging rolls, die casting machines, and special assembly machines. They handle parts of all shapes and sizes from small parts such as wire coils about 1″ in length to items the size of bathtubs and automobile roof panels. Fingers can be designed to hold practically any material, and the time required to alter the setup to handle a different part is only a matter of a few minutes. Mechanical transfer devices are used for both loading and unloading purposes.

Many transfer arms are powered by air cylinders at operating speeds up to 40 strokes per minute. One well known unit is a fully-contained machine operated by two air cylinders — a large one for lifting power and another smaller one for opening and closing the jaws or fingers. It is synchronized with press operation through a limit switch, and it operates after the ram ascends upon completion of the press operation. The unit may be mounted on the machine or on the floor in front of the machine. Machine mounted units have a "swinging arm" action, while floor mounted units operate with a horizontal reciprocating action and are usually somewhat slower than the former.

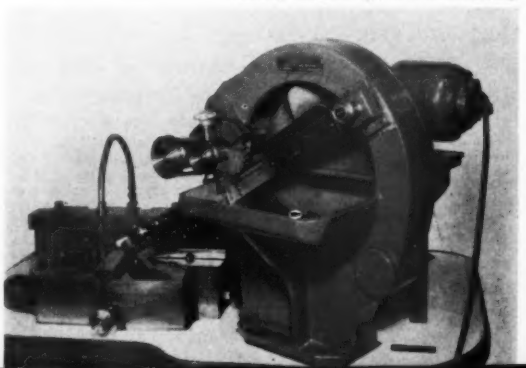
Other transfer arms are mechanically driven, often with two hands mounted at 90° to each other and operating as a team for feeding up to 60 parts/min . . . and at even higher speeds under certain conditions. Cycling of the mechanical arms and control of the grasping are achieved by means of a mechanical camshaft drive within the cabinet. One arm feeds the press or other machine while the second arm simultaneously asides the completed piece. Conveyors may be used with the unit for entirely automatic operation, and placement accuracy in the machine is within 1/16″ tolerance in relation to the center of the part. One rather unusual application of this type of feeder was in mechanizing the handling of rear-axle housings to a Heald No. 48 boring machine.[1]

Hopper Feeders

These constitute an extremely versatile group of automatic feeding equipment used primarily for feeding small parts, one at a time, from a container holding an indiscriminately dumped mass of parts. Unlike the machines discussed so far, hopper feeders, with slight alterations to the selector mechanisms, can feed a wide variety of parts to many different types of machine tools. Machines which have been successfully hopper fed include: screw machines, presses, broaching machines, gear hobbers, headers, welders, inspection machines, lapping machines, grinding machines,

Fig. 3. Hartford Special's automatic thread roller equipped with tumble-type hopper feeder.

Courtesy Hartford Special Machinery Corp.



precision gages, tapping and drilling machines, thread rollers, assembly machines, and induction heaters.

Many types and designs of hopper feeders have been constructed to solve the problem of handling small parts. Certain design characteristics, however, appear to be common to all. Basically, they consist of a receptacle for holding a large number of parts; a means for agitating the parts; a mechanism to select and pick up one or more of the parts; and a guide chute to carry the parts from the hopper. Bowl sizes of commercially available feeders vary from 3″ to 36″.

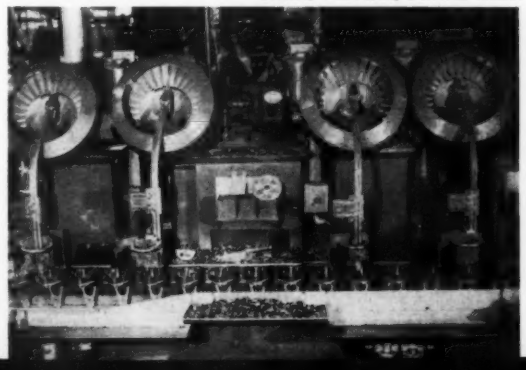
Some of the design principles of hopper feeders may be stated as follows: (1) provision must be made to agitate parts in some manner, (2) agitating actions should be made variable to control the rate of feed, (3) agitation of parts should be only as fast as is necessary to maintain the desired rate of feed, and (4) orientation of parts is usually possible depending upon the physical characteristics of the part. In general, successful hopper feeding requires that the parts (a) be capable of withstanding the agitation without fracture, and (b) do not bind in the feed chute.

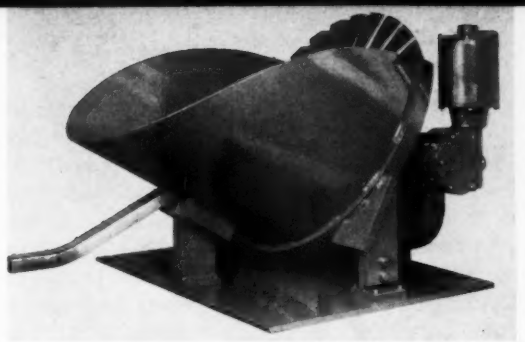
Some parts lend themselves to this method of feeding naturally, while others require complicated selector devices and orientating mechanisms. Physical characteristics which may be utilized to select and orient parts are: size, shape, weight distribution, magnetic properties, projections, notches, and shoulders. It is important to note that hopper feeding may be greatly facilitated by thoughtful product design. In view of today's trend towards automation, certainly most high-production items should be designed for automatic handling as well as for function, appearance, etc.

There are essentially 12 types of hopper-feeders in current use in industry. The **tumble-type feeder** consists of a large vertically mounted bowl or drum which rides on rollers and is driven by an electric motor at constant speed. The parts to be fed are contained in

Fig. 4. An application of rotary type hopper feeders for automatically feeding fasteners to assembly fixtures on straight-line index table.

Courtesy Delco-Remy Division, G.M.C.





Courtesy Detroit Power Screwdriver Co.

Fig. 5. Barrel feeder — a variation of the rotary type — has greater holding capacity and is more easily loaded mechanically. The cover is stationary and parts lie dormant except at bottom where collector ring rotates through.

the bottom portion of this drum and the lower portion of the lip. Rotation of the drum causes the parts to be agitated by vanes or buckets around the inside periphery. Some of the parts are carried by the vanes to a near-vertical position before they fall; and a few of these will, by chance, fall in such a position that they engage in an inclined rail or chute extending from the center of the hopper. The tumble-type feeder is "recirculating" in that parts which fall back into the hopper are continuously recirculated until they chance to fall onto the selector mechanism. This type of feeder cannot be used for fragile parts, but it is excellent for parts that tend to tangle or nest. Delivery rates up to 450 pcs/min have been obtained.

Rotary-type hopper feeders are constructed with a large stationary center plate and a rotating outer section which contains recesses designed to receive a single part or a group of parts. As the outer section is slowly rotated, the parts are agitated such that some of the parts align with the recesses and are retained within them. A baffle fastened to the stationary center section of the base plate prevents these retained parts from sliding out of the recesses until they reach a point at the top of the tilted hopper where a chute receives the parts as the recessed section moves by. These feeders have been successfully employed on a wide variety of parts including screws, rivets, bullet cores, discs, nuts, needle rollers, dowels, and washers. They are not well adapted, however, for parts which tend to tangle or nest. Feeds of 300 pcs/min have been obtained.

External-gate hopper feeders are primarily designed to handle circular parts larger in diameter than in thickness. Hoppers of this design have also been successfully applied to parts that nest badly. It consists of a large open bowl which receives and holds a quantity of work pieces. The back of the hopper is formed by a rotating gate disc which has nests around the edge, each shaped to receive

a single part piece. These nests may be merely pins or precisely machined slots, depending on the nature of the part. The weight of the mass of parts holds them against the disc, and as it rotates parts which chance to be in the proper position fall into the slots. These are carried with the rotation of the disc to an external gate and feed chute. Bowl sizes range from 3″ to 36″, and high delivery rates are possible.

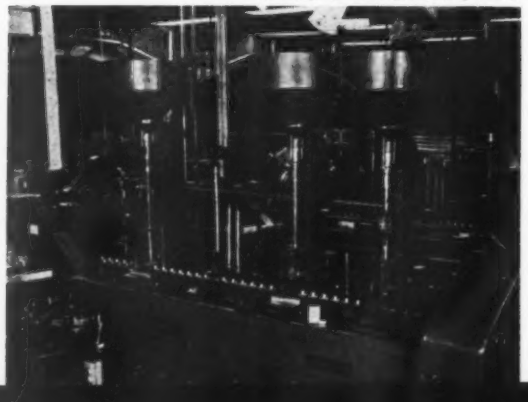
Centerboard-type hopper feeders utilize a cast bowl and an oscillating vertical blade or centerboard with a specially machined slot on its top edge. As this oscillating blade rises through a mass of parts in the hopper, a few pieces are picked up in the oriented slot. At the top of the stroke, the slot in the top of the blade lines up with a sloped chute which permits the parts to slide by gravity to the machine. If the chute is full, the parts remain on the centerboard and are carried back into the bowl. This feeder has been successfully used for cylindrical parts having a length greater than twice the diameter; also discs, washers, nuts, etc., can be handled by proper design of the centerboard slot. Various production rates are possible with the use of a variable-speed drive.

The **rotary-centerboard-type of feeder** also picks up parts from a bowl by means of a blade. In this case, however, a rotating wheel-like blade is employed. The blade is given a rotary, intermittent motion through a pawl and ratchet, Geneva mechanism, or cam-operated ratchet. The period of dwell occurs when the blade is in line with the exit chute.

Centrifugal-type hopper feeders are constructed with a horizontally mounted circular bowl to contain the parts. The bottom of this bowl is a slightly dome-shaped plate which is rotated by a motor drive in the base of the feeder. Rotation is slow, about 20 rpm, and parts dumped into the hopper are free to slide on the surface of this dome-shaped plate. A combination of centrifugal force and the inclined surfaces causes the parts to move toward the outside of the bowl as they are carried around by the rotating bottom plate. A spiral track is fastened to the inside wall of the hopper bowl, and the parts are pushed up this track to an exit gate where they pass onto a chute for feeding to the machine. This design is one of the few capable of feeding fragile parts.

Fig. 6. These tube-type hopper feeders are being used to feed cylindrical components of ignition condensers to assembly operations.

Courtesy Delco-Remy Division, G.M.C.



The **tube-type feeder** is a very reliable and simple device for feeding spherical and short cylindrical parts. The hopper body is funnel-shaped, and a hollow feed tube extends through the center of the hopper body and through a reamed hole. Either the feed tube is reciprocated through the fixed hopper, or the hopper body is reciprocated with respect to a fixed feed tube. If the feed tube is reciprocated, a telescopic connection is employed to connect the feed tube to the discharge chute. In either type, the open end of the feed tube is the selection and pick-up device; as it passes through the parts, a few enter the tube and slide down toward and into the discharge chute. These feeders are primarily designed for parts 1.000″ and under, and they have been used to handle parts as small as 0.030″ diameter.[2]

Vibratory hopper feeders or **bowl feeders** use electro-magnetic vibration to move parts up an inside spiral track from the convex bottom to the rim of the bowl. The vibratory unit and controls are contained in the base of the feeder, a rheostat being used to control the rate of feed. Vibratory feeders can be constructed to feed either clockwise or counterclockwise and with single or multiple discharge points. Bowls vary from 5″ to 30″ dia, and each feeder is engineered to handle a specific part of a certain size, weight, and shape. Feeders of this type can handle workpieces of almost any material including most fragile parts. Very thin, light parts are not suitable, however, since these will merely bounce without moving up the track.

Brush-agitator type hopper feeders consist of an inclined bowl in which the parts are agitated by a revolving brush, which causes them to pass through an opening and into a chute. This design has not been entirely successful because of rapid brush wear and excessive maintenance requirements. They have been used to feed small irregular shaped parts such as electrical contacts, eyelets, pins, bushings, stampings, and formed shapes.

The **oscillating-type feeder** handles simple headed parts such as nails, pins, rivets, screws, and tacks. The parts are dumped onto a hinged tray, which is given an oscillating motion by a crank mechanism. Parts in the tray

Courtesy Perry Equipment Co.

Fig. 7. Vibratory-type hopper feeder tooled for feeding zipper parts.

are agitated, and some of these orient themselves and slide through the gate and into one or more chutes feeding to the machine.

Many other hopper feeders have been developed for special purposes, including the Waterbury-Farrel **moving chain-type feeder** and the Cincinnati **Feedamatic hopper** used on grinding machines.

A chart is presented in Chart 1 which compares the previously discussed hopper feeders with the parts which each will most successfully handle.

Magazine Feeds

Strictly speaking, the magazine by itself is not an automatic feeding device since it requires manual loading; however, used in conjunction with hopper feeders it becomes an extremely important part of automatic feeding. It is used on practically every machine tool which is capable of being automatically fed.

The magazine feeder may be considered to be a mechanism which must be loaded with stacked parts, usually oriented. It consists of guides which hold the prepositioned parts and allow them to be gravity fed to the bottommost or end position of the magazine chamber. The parts are then fed from the end of the magazine into the machine by (a) magazine action, (b) gravity, (c) an air cylinder or mechanically operated slide, or (d) a push bar mounted in a machine turret.

The first method has been employed on single-spindle automatic lathes, using a power operated tailstock, and on small gear hobbers. The second method has been employed primarily in press feeding. The use of a slide for stripping the bottom piece from a magazine, method c, has been most widely used for inserting work in lathes, grinders, presses, assembly machines, milling machines, and broaches. The final method has been used primarily on screw machines by mounting the magazine on the cross-slide and using a push bar in the turret to remove the part and push it into the machine.

Magazine feeds can be used with a wide variety of parts ranging in size from 20′ bar lengths to minute screw machine parts. Three principles of importance to magazine design[3] are:

1. An escapement mechanism or other device must be used to assure feeding of one part at a time when feeding cylindrical parts.
2. When using a magazine feed with a pusher or slide to feed the bottom part, the total weight of the parts in the magazine must not be so great as to interfere with the action of the slide.
3. All related mechanisms must be accurately synchronized with machine operation.

Hopper Feeder Type \ Characteristics of Part	Flat Disc	Long Cylinders	Short Cylinders (2″ or less)	Shouldered or Headed	Spherical	Parts Subject to Tangling	Fragile
Tumble	X	X (to 4″)	X	X		X	
Rotary	X	X (to 4″)	X	X			
External Gate	X		X			X	
Centerboard	X	X (to 10″)	X	X			
Rotary Centerboard	X		X	X		X	
Centrifugal	X		X	X			X
Tube type			X		X		
Vibratory	X	X (to 8″)	X	X			X
Brush Agitator	X		X			X	
Oscillating	X		X	X	X		
Moving Chain	X	X	X	X			

CHART I — A comparison of the types of parts which the various hopper feeders will most satisfactorily handle.

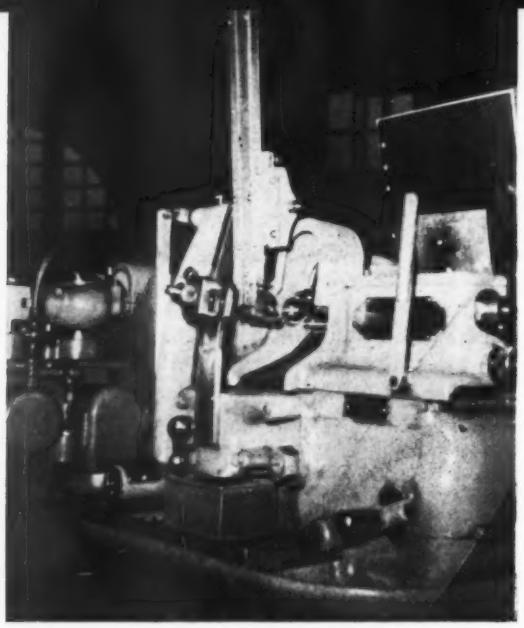


Fig. 8. Magazine feeder applied to a Barber-Colman gear hobber in the Purdue University machine tool laboratory.

Dial Feeds and Indexing Tables

These devices are used extensively for second operation press work and for feeding drill presses, milling machines, riveters, and other assembly machines. They are usually mounted on the frame or bed of the machine and consist essentially of a circular table which is rotated either continuously or intermittently to move parts from an outer loading position to the work position or positions. Usually the circular table is provided with a means of holding the work while an operation is performed on it. The workpiece may be loaded and unloaded by the machine operator or by automatic magazines, hopper feeds, slide feeds, transfer mechanisms, and/or gravity or air ejectors.

These feeders will handle any material and shape of part for which a work holder or nest can be designed. They offer great advantages when coupled with hoppers, etc. for automatic operation; however, they are also important as safety devices to permit hand loading of presses, etc. in areas away from the danger point. Also, the machine may be set up to pace the operator. Dial feeds, when used with presses which run at slower speeds and allow the operator time to load parts onto the circular table. Accuracy of these units is relatively high. With a Geneva indexing drive, location accuracies of 0.001" have been easily obtained on an 11" dia work circle. The device is self-locking and requires no external positioning device. Units can be obtained for 3, 4, 6, 8, and 12 stations with loads to 500 lbs.

Gear-driven dial feeds can be obtained with an even higher indexing accuracy and with more rapid cycling. Standard units are available with from 2 to 36 stations in any equal divisions of 360°. Movement of the table is controlled by a master sector gear governed by a modified cycloidal cam arrangement designed to control acceleration and deceleration of the table.

Ratchet-type dial feeds employ a ratchet plate and pawl to index the circular table. Feeds of this type which operate from a linkage to the crankshaft of the press are available with the driving mechanism located beneath the dial plate. This design is well adapted for work where the carrier plate is to be changed frequently or where dirt and chips are present, because the indexing mechanism is totally enclosed and protected. Dial diameters of from 10½" to 30" with either 8 or 12 stations are available. Presses using such feeds can operate at between 40 and 80 strokes/min.

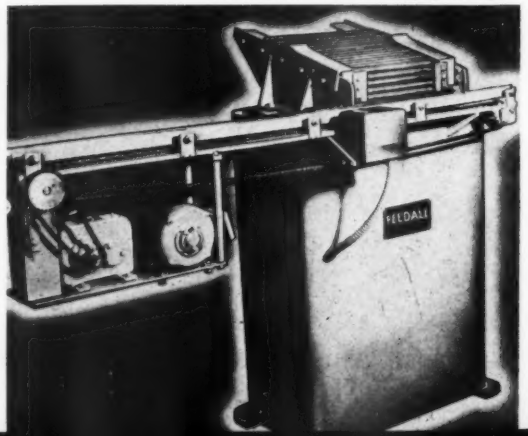
A variation from the usual dial feeder is one which has a mechanical hand to take the part from the nest (or holder) and place it in position for the punching operation. The unit is entirely self-contained, being driven by a variable speed drive . . . with a series of five cams which control the press, the dial table, and the action of the pick-up arm. The device is mounted on the bed of the press and is best adapted to open-back inclinable presses. No special dies are required on the press, the transfer arm delivering each piece and accurately locating it in a conventional die. The maximum rate of delivery which the feed can provide is about 50 pcs/min on an open-back inclinable press.

Roll Feeds and Grip Feeds

These feeding devices are used to load both gap-frame and straight side presses with roll or strip stock of metal, fibre, paper, mica, plastics, rubber, leather, fabric, or foil. The roll feeds employ a pair of power rolls driven and

Fig. 9. This automatic magazine loader feeds long cylindrical parts to centerless grinders, polishing machines, and inspection devices.

Courtesy Feedall Machine & Engineering Co.

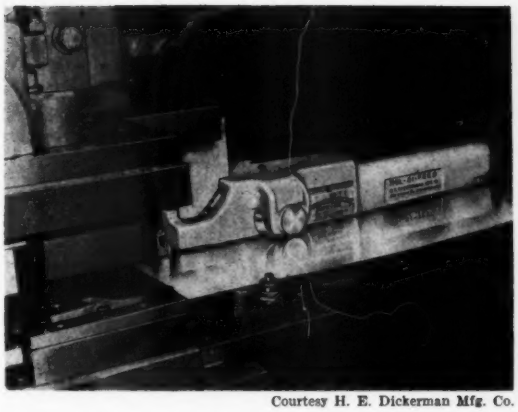


timed from the press slide or shaft. Both hydraulic and pneumatic feeds are also available, and very large roll feeds for handling wide coil stock are independently motor driven and self-contained. These latter feeds are synchronized with the press by electrical controls rather than by mechanical linkage. Both single and double roll feeds are available, double feeds being used where it is desired to drive the parent material on both sides of the press. Die design is important to the use of roll feeds, some of the principles[4] being:

1. Dies must permit stock to pass freely without binding.
2. Die design must provide for a certain amount of elongation of stock, or material will slip back through the feeding mechanism. Unless this provision is made, elongation will upset the uniform lead required between stations.
3. Design dies so that punches and pilots leave path of stock as early as possible. This will provide a longer feeding period, and keep rate of advance of stock into die as low as possible for greater accuracy.
4. Provide some means for positive registration of stock. (Pilots, stops, etc.)

On a conventional press, the feed operates intermittently so that the stock is stationary during the press stroke. While feeding, the material is pinched between the rolls by spring tension exerted on the upper roll, intermittent action being provided by stoppage of the rolls or by release of the top roll from the material. Both rack-and-pinion and gear-driven roll feeds are available.

Grip feeds operate on much the same principle as roll feeds except that the mechanism for advancing the stock is a reciprocating head carrying a gripping unit. This latter unit normally consists of an anvil as the lower member and a gripping finger or shoe as the upper member. The material is clamped and moved into the press on the forward stroke of the feeder and is released before the return stroke.



Courtesy H. E. Dickerman Mfg. Co.

Fig. 10. Open-sided roll feeds of this type can be equipped with neoprene covered rollers for feeding highly polished, pre-plated, or embossed strip stock to high speed presses.

Feeder Selector Guide

When a situation arises which indicates a need for automatic loading, the problem of equipment selection becomes immediately apparent. The questions which must be answered are:

1. Can the part or stock be automatically fed?
2. If so, what infeed mechanism will be most satisfactory?
3. If not, what design changes can be made to permit automatic handling?

As a guide to step 2 above, a feeder selector guide is shown in Chart 2 which summarizes the automatic feeding equipment which is currently available for machine tools and presses. It should serve as a helpful reference in the selection of such equipment.

CHART II — FEEDER SELECTOR GUIDE

MACHINE / FEEDER DATA	AUTOMATIC FEEDING EQUIPMENT	TYPICAL PARTS OR STOCK	SIZE RANGE
Boring Machines	Magazine with pusher for pushing parts into chuck	Camshaft bushings	Circular parts — Max. dia. about 4"
	Mechanical Transfer Arms	Long parts or complicated parts which cannot be handled in a magazine, such as a rear axle housing	Large parts as long as 5' Diameter depends on machine
Broaching Machines	Magazine used with shuttle table	Wrist pins; rear axle differential pins; bevel gear blanks	Circular parts — Max. dia. about 4" Max. length about 6"
	Hopper Feeders	Piston pins	Cylindrical parts — Dia. from 3/32" to 2" Length to 10"
			Circular parts — Dia. to about 4"

MACHINE / FEEDER DATA	AUTOMATIC FEEDING EQUIPMENT	TYPICAL PARTS OR STOCK	SIZE RANGE
Drilling Machines	Indexing tables with stations equipped with work-holding jigs or fixtures		Parts up to about 6" largest dimension
	Hopper Feeders	Bushings; Brackets; Discs; short tubes	Cylindrical parts — Dia. from 3/32" to 2" Length to 10" Circular parts — Dia. to about 4"
Gear Cutting Machines	Magazine mounted on machine slide	Gear blanks (normally for fine-pitch gears)	Length to 2" Dia. to 1"
	Mechanical Transfer Arms	Gear blanks	—
	Hopper Feeders	Gear blanks	—
Gear Finishing Machines	Mechanical Transfer Arms	Cluster gears; other gears	Cluster gears — Length about 6" Max. dia. about 3" Other gears — To about 10" dia.
	Magazines	Individual gears	About 6" dia.
Grinders — Centerless	Hopper Feeders	Piston pins; screw blanks; studs; valve tappets; small shafts; bushings	Thru-feed parts — Dia. ¼" to 1½" Length ½" to 18"
			In-feed parts — Work dia., stem Min. ⅛"—Max. 1½"
			Work length under head Min. 1½"—Max. 8" (Length greater than dia.)
			Work dia., head Min. ¼"—Max. 2" (Must exceed stem dia.)
	Magazines	Small Drills; pins	Cylindrical stock to 24" length 2" dia.
Grinders — Int'l Cylindrical	Magazine Feeder with push bar	Bearing races; bushings	Outside diameter about 4" max.
Grinder — Plain Cylindrical	Magazine Feeder and piston fitted with work carrying fingers	Valve guides	About 6" long Max. dia. about 1½"
	Magazine Feeder with loading cradle	Cylindrical parts such as armature shafts	Max. length about 10" Max. dia. about 2"
Grinder — Valve Face	Magazine Feeder with loading cradle and push rod	Valves	—
Honing Machines (Collet type Fixture)	Hopper or magazine feeder with hydraulic ram	Small cylindrical parts	Cylindrical parts — Dia. 3/32" to 2" Length to 10" Circular parts to about 4" dia.
Lathes — Turret	Pneumatic Bar Feed	Round, square or hex bar stock	Length—6' to 20' Dia. 1/16" to 3⅞"
Lathes — Automatic (Chucking and between centers chucking)	Magazine Feed with push bar	Lock cylinders; valve guides; valve guide bushings	Max. length about 6" Max. dia. about 2"
Milling Machines	Indexing Dial	—	Parts up to about 6" largest dimension
	Magazine used with shuttle type fixture loader or air-operated chucking device	Automobile spindle locking bolts; short shafts	Length to about 6" Max. dia. about 2"

MACHINE / FEEDER DATA	AUTOMATIC FEEDING EQUIPMENT	TYPICAL PARTS OR STOCK	SIZE RANGE
Polishing Machines	Magazine Feeds	Cylindrical parts	Cylindrical work — Length to 24" Dia. to about 2"
	Hopper Feeders	—	Cylindrical work — Length to about 8" Dia. to about 2"
Sawing and Cut-Off Machines	Automatic Bar Feeds	Round, square and hex bar stock	Length—6' to 20' Dia.—1/16" to 3⅞"
Screw Machines	Automatic Bar Feed	Round, square or hex bar stock	Length—6' to 20' Dia. to about 2", depending upon machine
	Magazine Feed with push bar mounted in turret (Magazine may be hopper fed)	Valves; valve guide bushings; small cylindrical parts	Max. length about 6" Max. dia. about 2"
Tapping Machines	Indexing Tables. Stations equipped with work holding jigs or fixtures. (May be Hopper fed)	Refrigerator valves; brackets; wing nuts	Parts up to about 6" largest dimension
	Hopper Feeders with work slide	Bushings; brackets; discs; short tubes	Cylindrical parts — Dia. 3/32" to 2" Length to about 10"
			Circular parts — Dia. to about 4"
Thread Rollers	Hopper Feeders (Special chain type)	Headed blanks for threading or straightening	Length to about 8" Dia. 3/32" to ¾"
Assembly Machines—Automatic	Hopper Feeders	Bolts; bearing balls; retainers; screws; rivets; washers; nuts; etc. (Practically unlimited)	Cylindrical parts to about 8" in length. Max. dia. about 2"
	Magazine Feeds		Flat circular parts up to about 4" dia.
	Mechanical Transfer Arms		Size range limited by assembly machine
Presses	Magazine Feeds with slide mechanism for placing part in die	Discs; cups; washers	Flat circular parts to about 4" dia.
	Hopper Feeders	Clips; small drawn cups	Flat circular parts to about 4" dia. Cylindrical parts — Length to about 8" Dia. to about 4"
	Mechanical Transfer Arms	Auto door panels; gasoline tanks; bath tubs; valves; bushings; brackets; discs; bearing retainer rings	Range or sizes limited only by press size
	Roll Feeds	Coil and strip stock	Max. thickness—0.188" Max. width—74"
	Grip or Hitch Feeds	Coil and strip stock	Max. thickness—3/16" Max. width—6"
	Indexing Dial Feeders	Discs; mounting brackets	Parts up to about 6" largest dimension. (Larger parts may be handled on special equipment)
Swaging Machines	Automatic Bar Feeds	Round, square or hex bar	Length—6' to 20' Dia. 1/16" to 3⅞"
Welders — Automatic	Indexing Tables with special work holding stations	Brackets, Coils	Parts up to about 6" largest dimension
	Hopper Feeders		Cylindrical parts — Dia. 3/32" to 2" Length to about 10" Circular parts — Dia. to about 4"

CHART III
MANUFACTURERS OF AUTOMATIC FEEDERS
Who Supplied Source Material for this Report

MANUFACTURER	Bar Feed Mechanisms	Mechanical Transfer Arms	Hopper Feeders	Magazine Feeds	Dial Feeds & Indexing Tables	Roll Feeds & Grip Feeds	Others
A. K. Tool Co., 2029 Blake Ave., Los Angeles, Cal.	x						
*The Barth Corp., 12650 Brookpark Rd., Cleveland 30, Ohio	x			x	x	x	
The Bellows Co., 222 West Market St., Akron 9, Ohio				x	x		Slide Feeds
*Cincinnati Grinders Inc., 4701 Marburg Ave., Cincinnati, Ohio			x				
Cook & Chick Co., 640 S. Miller St., Chicago, Ill.			x				
Detroit Power Screwdriver Co., 2827 W. Fort St., Detroit 16, Mich.			x				
H. E. Dickerman Mfg. Co., 324 Albany St., Springfield, Mass.						x	
Feedall Machine & Engineering Co., 38399 Pelton Rd., Willoughby, Ohio			x	x			
Hartford Special Machinery Co., 292 Homestead Ave., Hartford 12, Conn.			x		x		
Hautau Engineering Co., 721 Wanda Ave., Detroit 20, Mich.		x					
*Henry & Wright, Div. of Emhart Mfg., 511 Windsor St., Hartford 1, Conn.						x	
*The Klaas Machine & Mfg. Co., 4314 E. 49th St., Cleveland 25, Ohio			x		x	x	
Kraus Design Inc., 950 Exchange St., Rochester 8, N. Y.			x				
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse 1, N. Y.	x						
F. J. Littell Machine Co., 4197 Ravenswood Ave., Chicago 13, Ill.						x	
Magnaflux Corp., see MacDonald Bros. Inc., 208 S. LaSalle St., Chicago 4, Ill.		x					
Mead Specialities Co., 4114 N. Knox Ave., Chicago 41, Ill.				x	x		Slide Feeds
*Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.				x			
*National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.				x			
Perry Equipment & Engineering Co., 3125 Brandes St., Erie, Pa.			x				
Sahlin Engineering Co., P. O. Box 289, Birmingham, Mich.		x					Sheet Metal Shuttle Feeders
Syntron Co., 1938 Black St., Homer City, Pa.			x				
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.					x		
U. S. Engineering Co., 40-24 22nd St., Long Island City 1, N. Y.			x				
*The V & O Press Co., Div. of Emhart Mfg. Co., 421 Union Tnpk., Hudson, N. Y.					x		
*The Waterbury Farrell Foundry and Machine Co., Waterbury 20, Conn.			x				
Wilson Automation Co., P. O. Box 3855, Detroit 5, Mich.		x					Walking Beams, Conveyor Feeders, etc.
Wittek Mfg. Co., 4323 W. 24th Pl., Chicago 23, Ill.						x	
OTHER MANUFACTURERS OF AUTOMATIC FEEDERS							
The A. K. Allen Co., 57 Meserole Ave., Brooklyn, N. Y.					x		
Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Cal.					x	x	
*The Bodine Corp., Bridgeport 5, Conn.					x		
Boyar-Schultz Corp., 2000 S. 25th St., Broadview, Ill.	x						
Cooper Weymouth, Inc., 277 Noble Ave., Bridgeport 8, Conn.						x	
The Denison Engineering Co., Columbus 16, Ohio					x		
Dexter Folder Co., Pearl River, N. Y.							Sheet Feeders
Durant Tool Supply Co., 136 S. Water St., Providence 3, R. I.						x	
Erickson Tool Co., 2301 Hamilton Ave., Cleveland 14, Ohio	x				x		
Feedmatic Inc., 22519 Telegraph Rd., Detroit 19, Mich.			x				
Ferguson Machine & Tool Co., Inc., P. O. Box 191, St. Louis 21, Mo.					x	x	Straight-Line Index Chassis
General Mills Inc., Mechanical Div., 1620 Central Ave., Minneapolis 13, Minn.				x			
*Greenlee Bros. & Co., 2043 Mason Ave., Rockford, Ill.	x			x			
Hamilton Automation, Inc., 1490 Edison Ave., Hamilton, Ohio		x					Sheet Metal Shuttle Feeders
Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Cal.			x				
Industrial Heating Equip. Co., 3570 Fremont Pl., Detroit 7, Mich.							Metering Bulk Loader
Jaco Devices Inc., 102 High St., Hingham, Mass.						x	
*Kalamazoo Tank and Silo Co., Machine Tool Div., 115 Harrison St., Kalamazoo, Mich.	x						
Lamb Co., F. Joseph, 6343 Wight St., Detroit 7, Mich.			x	x			
Michigan Drill Head Co., Detroit 34, Mich.					x		
Modern Engineering Service, Inc., 1695 Twelve-Mile Rd., Berkley, Mich.							Sheet Lift-and-Carry Feeders
Perkins Machine Co., Warren, Mass.						x	
Peterson Co., Carl G., 9 Warren Ave., E. Providence, R. I.						x	
Pneuma-Serve, Inc., 19930 Detroit Rd., Rocky River, Cleveland, Ohio			x				
Precision Detroit Co., 20100 Sherwood Ave., Detroit 34, Mich.					x		
Roll-Feeds Corp., Pawtucket, R. I.						x	
Roll-O-Matic Industries, 18533 Weaver, Detroit 28, Mich.	x						
Swanson Tool & Machine Products Co., Erie, Pa.					x		Straight-Line Index Chassis
U. S. Tool Company, Inc., Ampere, N. J.						x	

*These and numerous other machine tool and special machinery builders build into their machines feeding equipment of their own design and manufacture.

Streamlined Indexing of TOOLING MANUALS

by Russell Coberth
Tooling Procedures & Standards Engineer
THE GLENN L. MARTIN COMPANY
Baltimore, Maryland

MANUFACTURERS USING COMPANY MANUALS to educate their employees know only too well the difficulty of keeping indexes up to date. Improvements in tools and processes introduce many new items which could easily be lost without a simple, flexible, indexing method.

The Martin Manufacturing Division Manual has mushroomed from a simple list of tools used in the plant, to a useful medium for information about tooling.

Symptoms of growing pains were recognized when subscribers complained about the bulk of the manual. There were over 1000 pages of detailed information covering Tool Drafting Practice, Standard Manufacturing Data for Non-Design Tools, Machine Reference Data, Standard Production Type Tools and Tool Crib Items, Standard Tool Materials and Costs, and Tool Manufacturing Processes. Indexing this material for ready reference was a periodic headache.

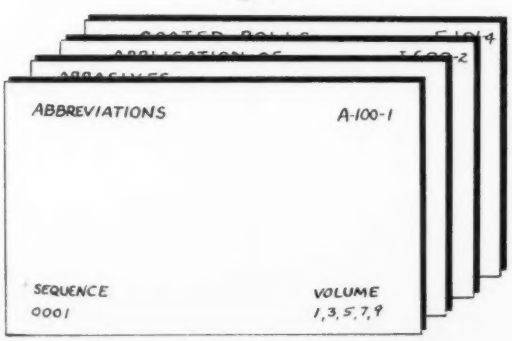
A survey showed that little or none of the information in the manual could be deleted. One course struck at the root of the problem. Were the manual to be divided into departmental volumes, each department would get the information it needed, minus the bulk of irrelevant material. There was one bug in this idea: how to maintain an up-to-date index for each volume, when some of the same information was pertinent to all volumes.

Indexing systems of past and present were reviewed and found wanting. However, the idea which seemed most promising was to adapt the versatility of the I.B.M. tabulating machines to this specific problem.

The first step was to screen the whole manual and group the pages into nine appropriate departmental sections. A preliminary card-index file was made from these pages, using the standard 3 x 5 white file card. Information put on this card was: page title, page number, and the volume numbers for which the page was intended.

In the next stage, all the cards were grouped according to function; viz., all dies, including form dies, pierce dies, etc., were grouped under Dies. Slip bushings, washer bushings, liner bushings were grouped under Bushings. And so on, until all items were properly grouped. Then the groups were arranged alphabetically, as were all the items in the groups. After this, all the cards were numbered consecutively (Fig. 1).

Figure 1



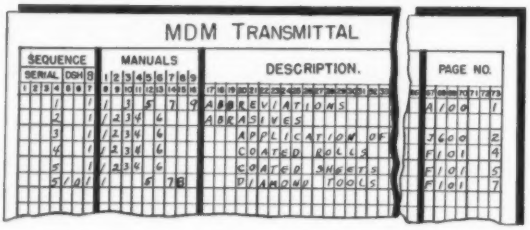
Many smaller companies can profit by these techniques used for organizing technical information of interest to engineers in various divisions and departments.

A transmittal sheet was designed, and data from the preliminary card-index transcribed upon it (Fig. 2). Reading from left to right on the transmittal sheet, the first 4 digits represent the entries in numerical sequence. The four digits permit 9,999 entries. Digits 5 and 6 permit 99 new or added items for each original entry. Thus the scope of this system is broad enough not to be outgrown easily. Digit 7 is for coding the number of I.B.M. cards used for any one entry. Digits 8 through 16 indicate which volume or volumes will carry a particular page. The remainder of the sheet is used for the title and page number.

Transmittal sheets were prepared for the whole index and the I.B.M. tabulating cards were key punched (Fig. 3). The tabulating machines produced a neatly typed page which was essentially a replica of the Transmittal Sheet, but without digit divisions.

Nine tabulating runs were made, one for each manual. Each run eliminated all cards except those for the manual being run. Thus, each of the nine manuals had a separate and different index made from one master set of I.B.M. tabulating cards.

Figure 2



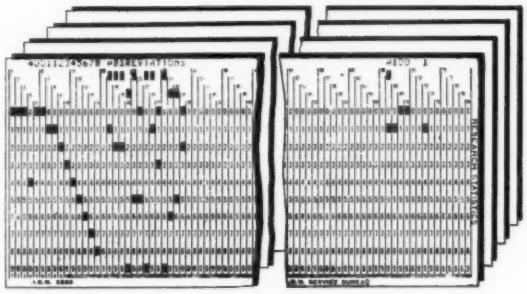


Figure 3

The next step was to arrange these tabulated pages into reproducible copy for the nine Manufacturing Division Manuals. Each index (Fig. 4) was then printed along with other M.D.M. pages for that particular volume and collated according to routine procedure.

In order to revise the index (and the manual) by the addition of a new item, an open number from 1 to 99 is selected so that it falls into proper alphabetical arrangement, and is added as digits 5 and 6 to the numerical sequence. This item is then entered on the transmittal sheet with other items pending revision. It is now possible to revise nine separate indexes (by adding to the transmittal sheet or by deleting an I.B.M. card entirely) in less time than was formerly required for revision of one index, using the straight typing or stripping-in method.

GLENN L MARTIN CO MANUFACTURING DIVISION MANUAL INDEX

KEY TO INDEX

Most subjects will be found listed under their purpose or family group: i.e. Riveting tools and equipment under RIVETING; while dies for blanking or forming would be listed under DIES.

A

ABBREVIATIONS	A-100- 1
ABRASIVES	
APPLICATION TO DISCS AND DRUMS	J-600- 2
COATED ROLLS	F-101- 4
COATED SHEETS	F-101- 5
DIAMOND DRESSING TOOLS	F-101- 7
GRINDING WHEELS	F-101- 1
INTRODUCTION	F-101
MOUNTED POINTS AND WHEELS	F-101- 6
SANDING BELTS AND SLEEVES	F-101- 3
SANDING DISCS AND ACCESSORIES	F-101- 2
WIRE WHEEL BRUSHES	F-106- 1
ADAPTORS	
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AUTOCLAVE	J-416- 4
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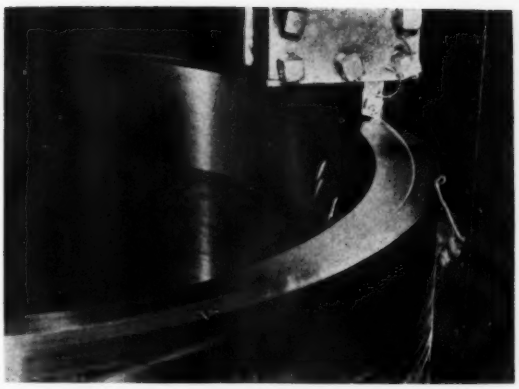
PETERS-DALTON OVEN	J-416- 11

MANUFACTURIN

Figure 4

. . . Cemented Oxides From Page 80

Cemented oxide tool here was used with water soluble coolant to make a 9½" cut on O.D. of nickel-chrome-moly steel retaining ring. After 17 minutes of cutting the tip showed a wear band of about 0.002".



In making half of a 2⅝" cut on the face of the retaining ring, the cemented oxide tip showed hardly any wear, while carbide showed a wear band of about 0.010" in finishing remaining half of cut.

Currently used with mechanical holders, tips of the new material not only will machine materials such as 1045 and softer steels, but also 4340 type and nickel-chrome-moly steels with Brinell hardness up to 300.

Wear resistance of the new material is such that on some tests it indicated a tool life of considerably more than 25 to 1 over carbides employed. For finishing cuts, the material is expected to reduce cutting time drastically — taking up where carbides leave off at super high speed machining ranges.

So far as known now, tool tips of cemented oxide can be wet ground successfully with 220-grit diamond wheels. Use of finer diamond wheels is possible, but longer grinding time is required. Silicon carbide wheels have been used for rough grinding only. A honed edge around the cutting edge and nose radius of the tool tip is a must.

In addition to use as cutting tool materials, the physical properties suggest applications where high temperature strength coupled with low density, resistance to oxidation at elevated temperatures and combined abrasion and corrosion resistance are required.

Cemented oxide is made of materials which are in abundant supply, and is processed by powder metallurgy techniques. Thus ultimately the usual variety of shapes should be available.

At the machine tool builders' show in Chicago, the cemented oxide was run on new high-speed machines at speeds up to 2500 sfpm with good results. Carboloy engineers feel that the new tool material will have a definite influence in the design of tomorrow's machine tools — putting the emphasis on machines capable of removing metal at speeds up to 7500 sfpm.

Close-up showing finish provided by cemented oxide tool (inner cut) and that of carbide on hub of 7' turbine wheel.

FRICTION IN THE PROCESSING OF METALS

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The knowledge of processing and especially of the cutting of metals has matured to where it is now an applied science, which is based chiefly on a recognition of the effect of friction.* This friction largely consists of the making and breaking of contact welds ("microwelding") between two rubbing metallic surfaces. Observation of microwelding factors leads to a simple explanation of apparently complicated relations and thus a realization that machinability is to a great degree controlled by friction.

TAYLOR PUBLISHED his famous book "On the Art of Cutting Metals" way back in 1906. Nowadays our knowledge of cutting metals is becoming more and more an applied science[7], i.e. a knowledge not only of "how", but also of "why". A comprehensive understanding of cutting phenomena is possible only through knowledge of applied physics.[6] This report is intended to show to what extent chip formation and other metal processing phenomena can be explained in terms of friction.

What Is Friction?

We know that if we wish to slide a body "Q" along a horizontal plane of another, greater body (Fig. 1), we must apply a force "q". Thus, we realize the existence of a force

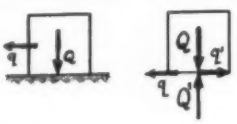


Fig. 1. Elementary friction.

called the force of friction, which hinders the sliding of the body "Q". The horizontal force "q" is equal and opposite to the force of friction; and, the relation of the force "q" to the weight of the body "Q":

$$\mu = \frac{q}{Q} \quad \ldots\ldots\ldots\ldots (1)$$

is called the coefficient of friction.[19]

An understanding of one type of friction phenomena will be aided by reference to the following diagram (Fig. 2). The surfaces of bodies rubbing against each other are always more or less rough and uneven.

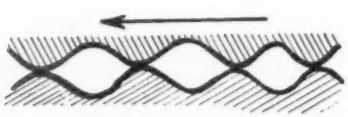


Fig. 2. Illustration of friction.

Therefore, the peaks and valleys of both rough surfaces act like the teeth of two gears. By relative movement of both rubbing surfaces, the toothlike surfaces enter into collisions which can result in the breakage of the weaker peaks of the softer body by the stronger peaks of the harder one. This phenomenon may be called "mechanical friction".

There is also another kind of friction, called "friction by adhesion" or "friction by weldability". It consists of contact welding of individual protruding points, a phenomenon taking place at the beginning of the contact, which ends by rupture of welded spots.

If the welds realized are strong, their rupture demands more force and the coefficient of friction is high.[17, 18, 19] This rupture of the welded spots may occur through the material worked, which is being welded to the tool. (Example: when the minute particles of work material "build-up" an excrescence on the cutting edge). This takes place, e.g., at low cutting speeds, when the cutting tool is still relatively cool and its strength is superior to the strength of the material cut. The rupture of the welded spots may also take place through the tool material. When it is hot at high cutting speeds, the tool material is weaker than the (much cooler) material cut and the spot rupture occurs in the weakest point, that means through the tool material. This results, of course, in an erosive wear of the tool.

The factors favorable to contact (or "pressure") welding are supposed to be:

1. High **pressure** between the rubbing surfaces.
2. High **temperature** at the contact surfaces.
3. Very **intimate contact** of both rubbing surfaces.
4. Long **duration** of this intimate contact.
5. Various **physico-chemical** factors, such as the faculty of both rubbing materials to form solid solutions, the melting point of these solutions, their chemical composition and affinity, further, their microstructure, and, especially, their grain size and coincidence of fibre-lines with the rubbing direction.[3, 4, 5, 13, and 20]

These relations began to be evident after 1931, rate of the appearance on the market of the first cemented carbide grades containing TiC additions to the formerly pure WC + Co compositions. Later development (chiefly in the United States) indicated the possibility of using TaC instead of or together with TiC.

A complete physical explanation of the existing relations is credited to Dawihl in Germany, who tested in 1940 and 1941 the contact welding temperature of different carbide grades to carbon steel.[3, 4, 5] Recent and very interesting articles — an American report by Shaw and Smith[20] and a British report by Trent[25]—confirm entirely the Dawihl explanation and add some very interesting new details.

The chief factor in this kind of friction is pressure. The following diagram (Fig. 3) represents friction as a function of pressure applied.[20]

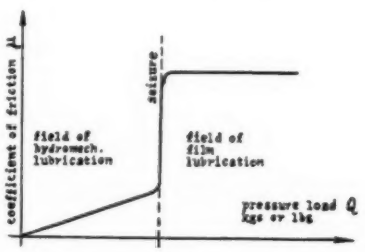


Fig. 3. Coefficient of friction $\mu = \frac{q}{Q}$ as a function of pressure load "Q" applied. (After Socony Vacuum Oil Company.)

Up to a certain pressure limit, metallic contact may be prevented by a hydro-mechanical lubrication, i.e. by introduction between both rubbing surfaces of a layer of liquid lubricant, which is thick and strong enough to prevent the mutual engagement of the roughness of the sliding surfaces. Above this pressure limit there is no liquid lubricant that would be able to support the applied load in the hydro-mechanical way, and the lubrication can be obtained only by means of a fatty or chemical film, which prevents direct metal-to-metal contact of the rubbing surfaces. Differences in friction phenomena and in lubrication methods are therefore, caused merely by different ranges of pressure.

*Also, see "Some Aspects of Machining and Machinability", by Frances W. Boulger, Tooling and Production, Jan. 1954, pp. 50-55.

Thus, the friction "F" is supposed to be chiefly composed[18] of mechanical friction "M" and of friction by adhesion or weldability "W".

$$F = M + W \quad \ldots\ldots(2)$$

The part played by mechanical friction "M" in the processing of metals seems to be usually much smaller than the part played by weldability "W":

$$M << W \quad \ldots\ldots(3)$$

Therefore we often may consider, for practical purposes, that friction in the processing of metals consists mainly of (micro) weldability, which we express by the following equation:

$$F \cong W \quad \ldots\ldots(4)$$

Where Does Friction Occur?

In metal cutting we are concerned, as represented in the simplified chip formation diagram* (Fig. 4), with the **external friction** between the clearance face of the cutting tool and the machined surface of one side,

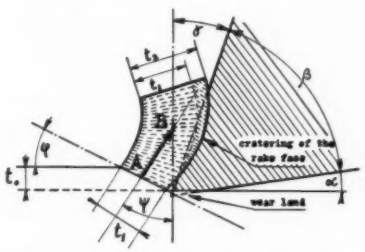


Fig. 4. Simplified chip formation diagram for steel.

and between the rake face of the cutting tool and the chip of the other side.[19] Besides this there exists an **internal friction** between individual layers of the deformed chip. This internal friction takes place in primary chip deformation (D_1) at its separation from the work and in secondary chip deformation (D_2) as it rubs against the face of the cutting tool. We see in the following Figure 5 what happens when the chip formation, taking place according to the previous diagram, is balanced. The part played by different friction forces (F, D_1, and D_2) is quite evident.

In the cold drawing of wire (Fig. 6), we note also an **external friction** between the external layer of the drawn wire and the working surface of the die. There is also, of course, an **internal friction** between individual layers of the wire deformed by the drawing die.

Similar relations may also be observed in other processing operations. We always see the worked

*The simplified chip formation diagram (Fig. 4) and the simplified balance of chip reaction forces (Fig. 5) are explained and discussed in detail in another report of the writer. This explanation is valid only for a relatively light chip thickness (fine feed per revolution) with practically no torque effect.

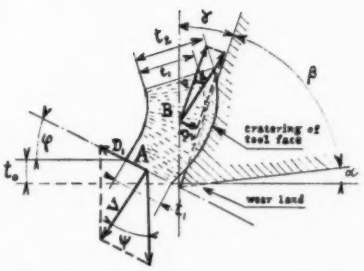


Fig. 5. Simplified balance diagram of chip reaction forces.

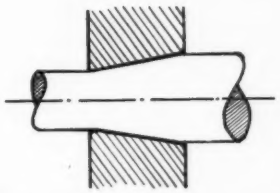


Fig. 6. Diagram of cold drawing of wire.

metal rubbing against the worked surfaces of the applied tool, and the distortion of the individual layers of the worked metal. The conditions of friction differ from one metal-working process to another. Thus, in drop forging the high working temperature, being itself an important factor of weldability, at the same time reduces the deformation forces as compared to the cold working conditions.

Metal processing operations always cause more or less rapid tool wear due to erosion by weldability. Such erosion consists of the removal of tool metal particles welded by contact to the processed metal.[2, 15, 19, 20, 28]

Microwelding Factors Control Metal Cutting

At the present time metal cutting is the most prevalent kind of processing. We shall, therefore, attempt to show how different microwelding factors influence and control chip formation, the principal phenomenon in metal cutting.

Let us, for instance, first consider the influence of cutting speed. The duration of contact of two rubbing surfaces is necessarily inversely proportional to their rubbing speed. For this reason, when considering the influence of cutting speed, we obtain the reversed picture of the duration influence.[17]

Both diagrams of Figure 7 show the variation of the tangential cutting force "T" as a function of cutting speed "v". It is characteristic that this variation is nearly linear in bilogarithmic scale (Fig. 7B). The diagram in decimal scale (Fig. 7A) is helpful in better understanding the role of two characteristic speed limits: v_A and v_B.

As is well known to any machinist, below a certain speed limit "v_A" (built-up edge speed limit) the chip welds excessively to the cutting edge and causes its chipping, while the welding of the clearance or relief face of the edge against the machined surface results in its "scuffing" and a poor surface finish. The "v_A" values, which are rather optional, depending on specific conditions of the job performed, are higher for negative rake angles and lower for positive rake angles[17]. Further increase in cutting speed above "v_A" speed limit causes only a rather slight drop in tangential force (seen on the 7A diagram).

Above a certain very high speed limit "v_B" (burnt chip speed limit), there is a rapid drop in tangential force, due to a decrease of chip deformation forces in a very hot (and even "burnt") chip. The "v_B" values are lower for negative rakes and higher for positive rakes. This drop in cutting forces associated with the increase of cutting speed (and with

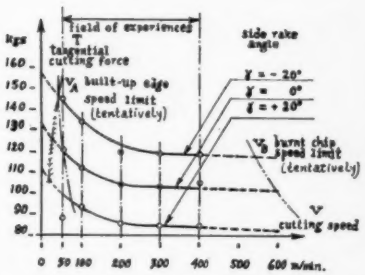
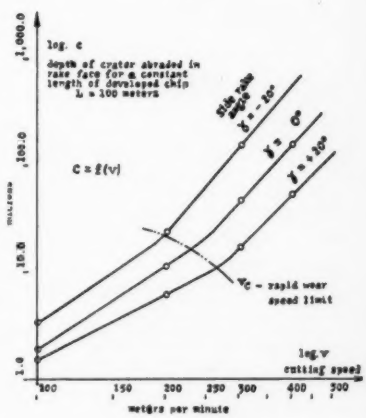


Fig. 7. A — Decimal scale. B — Bilogarithmic scale. Diagrams of tangential cutting force "T" (in kgs or lbs) as a function of cutting speed "v" (in meters or surface feet per minute). Full line — part covered by own experiences of the writer; dropped line — hypothetical.



drop in contact duration) may serve as explanation for the technique of high (positive) rake rapid milling employing HSS cutters similar to those used for wood working.[9, 27]

The drop in cutting forces with the increase of cutting speed is self-ex-

planatory. The writer believes that in the high rake rapid milling method the cutting forces are reduced jointly by high cutting speed (short contact duration) and high rake angle (low cutting pressure due to a small chip deformation) applied. An overheating of the cutting edge does not occur, here, because of the small cutting forces. Also, there is hardly time enough for any heat exchange between work, chip and tool, and it is rather to be supposed that the temperatures of these three cutting components are exclusively due to heat generation and dissipation within themselves and not to any heat transmission among them. In this milling method the "v_B" point is sufficiently lower than the "rapid wear" point "v_c" (which we will discuss later, explaining the graph of Fig. 8).

The Figure 7 graphs are also helpful in explaining the role of cutting speed in carbide cutting. **The carbide tools always have much lower rake angles than the HSS ones. This fact increases the pressure of the deformed chip. In the high pressure range, the contact duration (inverse of the cutting speed) becomes more critical as a microwelding factor.**

The fact that there are always microwelding factors which play a chief role in cutting of metals may also be confirmed by application of cutting fluids on interrupted cuts, where its occurrence on the cutting edge is to be expected. We may safely state that there is always a certain likeness between the influence of any of the microwelding factors involved.

Heat is produced in the chip, in the workpiece, and at the cutting edge of the tool.[24] If the rate at which the heat is produced at the cutting edge exceeds the rate at which it can be dissipated through the tool (influenced by the cross-section of the tool edge and shank, and by the specific thermal conductivity of the tool material) and/or by the coolant applied, the cutting edge temperature increases sufficiently to aid in microwelding tool metal particles to the surfaces of both the machined part and the chip, thus causing a very rapid tool wear. This seems to be confirmed by the results of the own research work of the writer.[19]

As we see on the graph in Figure 8, the depth of the eroded crater on the rake face of a carbide tipped tool, measured for the same and constant length of developed chip and taken as a function of cutting speed, may be represented as a straight line in a bilogarithmic system of coordinates. Nevertheless the inclination of this straight line changes in point "v_c", which we call "rapid wear speed limit". Below "v_c" the heat dissipation is stronger than the heat creation, and the inclination of our straight line is small. Above "v_c" the heat creation is stronger than the heat dissipation, and the inclination of our straight line is greater.

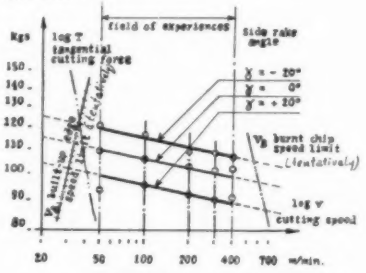


Fig. 8. Depth "C" of crater abraded in the rake face of a carbide tipped tool (grade: WC + 3% Tic + 8% Co) when turning steel SAE 1055 HR with a constant length of tool travel (L = 100 meters) as a function of cutting speed "v" for three different values of side rake angle.

The writer does not provide more experimental data about the heat dissipation by workpiece and coolant, but he believes that the picture is very similar. Of greatest importance should be the rate of heat dissipation from the point of contact between workpiece and tool edge. Of secondary importance should be the manner of heat dissipation — through the workpiece body, or by coolant.

The influence of cutting speed on the roughness of the machined surface can also be easily explained with the help of friction phenomena.[16] Surface roughness may be understood as being composed of the three following parts (Fig. 9):

1. **Macrogeometry,** due to the elastic deformation, lack of rigidity and play of the machine tool, fixture, workpiece, and the cutting tool.
2. **Microgeometry,** produced as the path of the tool nose on the machined surface and, therefore, due to the size of the nose radius and to the feed per revolution.
3. **Burnishing** of the machined surface, being directly the result of the rubbing of the relief face of the cutting tool against the workpiece.

Fig. 9. Diagram of the usual composition of roughness of a machined surface.

In this classification it has been assumed that the machining has been accomplished **without chatter.**

In metal cutting done correctly the amplitudes and the wave length of all these three components of roughness follow each other. Nevertheless, at low cutting speeds, the microwelding between the worked metal and the cutting tool produces (due to the built-up edge formation) a badly scuffed surface. With an increase in cutting speed the welding tendency decreases, thus reducing the surface scuffing and improving the burnishing action.[17] This results in a mere polished and shining appearance of the machined surface.

With machining conditions as exist when working with HSS tools, i.e. when the cutting speed is rather low, and especially when working with interrupted cuts, as in milling operations, a reduction of friction may also be achieved by the introduction of anti-welding agents close to the cutting edge. There are three kinds of anti-welding agents:

1. **Direct anti-welding agents,** for example, plain sulphur added to cutting oils in order to improve their properties. Sulphur forms a thin film covering the rubbing surfaces and hindering the direct metal-to-metal contact necessary for microwelding.
2. **Indirect anti-welding agents,** such as combined sulphur, chlorine or even phosphorus which are added to modern "active (black) cutting oils". Their chemical activity consists of a simple chemical exchange reaction according to following pattern:

$$ES + Fe \rightarrow FeS + E \quad \text{.....(5)}$$

The sulphide of "E" reacts here with iron of the tool and the machined steel, producing a layer of iron sulphide on the metallic surface, which forms a "protective chemical film."

3. We may also easily suppose the existence of **catalytic anti-welding agents** (R), which cause quite a chain of chemical reactions, viz. like the following pattern:

$$\underline{R} + H_2O \rightarrow RO + H_2 \quad \text{.....(6)}$$

and,

$$RO + Fe \rightarrow FeO + \underline{R} \quad \text{.....(7)}$$

The protective coating (chemical film) should in this case be composed of iron oxide (FeO), like an oxide film created on HSS tools by the newly developed "steam treatment".

The anti-welding agents are usually added to cutting oils or water soluble compounds in order to reach the cutting edge via the coolant. The fact that many investigators stated that **often the cutting fluids exercise no lubricating and only cooling action**[24, 25] may be easily explained by the bad penetration of the cutting fluids up to the cutting edge and the high cutting speed. The lubrication is only possible when the lubricant is actually present on the cutting edge and is, therefore, facilitated by interrupted cuts. Moreover, lubrication is only necessary when conditions are conducive to microweld-

ing. The extent of microwelding is minimized by high cutting speed (and short contact duration). This is also the explanation of why we often use cutting oils for machining operations performed with HSS tools and almost exclusively water emulsions when using steel-grade carbide tipped tools (with exception of deep drilling operations). This situation is also highly influenced by the specific contact welding temperature, which has been established by Dawihl in Germany[4] for mild carbon steel as follows:

for HSS 18-4-1 575°C (1070°F)

for carbide grade WC + 6% Co 625°C (1150°F)

for carbide grade WC + 16% TiC + 6% Co 775°C (1390°F)

These figures give a supplementary explanation of why the cutting fluids for machining with carbide tipped tools exercise cooling rather than lubrication action. They also give evidence that, up to a certain point, a plain water coolant, containing only rust preventive ingredients, can act as a lubricant decreasing the very important microwelding factor of contact temperature ("cutting temperature").

Another source of anti-welding agents may be found either in the material cut, such as in free cutting steels and alloys with fine inclusions of lead or some sulphides[10, 22, 29] or in tool material.[20]

The advantage of this last conception evidently reposes in a separation of high wear resistance from high hardness and brittleness of tool material. Steel working carbide grades contain TiC or/and TaC which act by lowering the specific pressure welding temperature of carbide to steel; but, being structural components and not inclusions, these ingredients at the same time increase the hardness and the brittleness of the tools.

The temperature is another very important factor affecting the microweldability. Its influence on metal

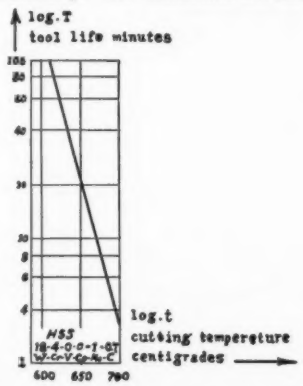


Fig. 10. Tool life ("T" minutes), as a function of cutting temperature ("t" centigrades) for a HSS tool. (After Schallbroch, Schaumann & Wallichs).

cutting was for a long time misinterpreted, since temperature affects not only the weldability, but also the hardness. HSS tools lose hardness . . . and cutting ability . . . if heated above the drawing temperature. The influence of the cutting temperature (measured on the edge point of the tool) on the tool life is shown on the diagram, Figure 10, in bilogarithmic network.[8]

We have known for a long time that the temperature at the cutting edge exerts a great influence on the tool life. The modern theory of friction of metals and microweldability gives us a basic explanation of this phenomenon.

Let us now mention some practical examples taken from the machine shop. Hans Ernst of the Cincinnati Milling Machine Company reported as early as 1938[6] that he noted a great improvement in tool life and surface finish when putting ice inside a sleeve turned from aluminum alloy (heat dissipation by the workpiece). Similar results were reported when cooled cutting oils were used on free screw cutting of steel in Switzerland, where, as we see in Tables I and II, it was possible to increase the tool life and the hourly output at the same time.[16] Similar results have also been reported from Germany with highly fluid active cutting oils.[21] (heat dissipation by the coolant). Other results obtained in the United States[1] don't seem to be in contradiction with them. These results most probably may be explained by the secondary influence of cutting oil viscosity, which increases with the drop of temperature.

The fact that the efficiency increase is greater for carbide tipped tools (Table II), where the influence of the temperature on the hardness is very small, than for HSS tools (Table I), proves again that the **increased efficiently is due chiefly to the decreased microweldability** between the cutting tool and worked metal and not so much to prevention of possible loss of hardness in the cutting tool, as one had stressed it before.

We can discuss now the influence of some physico-chemical factors on microweldability. First, the weldability by contact is evidently increased by the faculty of engaged materials to form solid solutions. We know that the direct anti-welding agents (e.g. sulphur or lead) do not form solid solutions with either of the rubbing materials.

Other factors are microstructure and grain size. We are aware that stripped or banded fiber microstructure of machined metal or of HSS used for cutting tool always results in a poor finish of worked surface. A like influence was also observed by the writer for overheated coarse-grained structure of both involved materials.

TABLE I*

Increase of efficiency of HSS tool due to the supplementary cooling of cutting oil, realized at the Tschudin Works in Switzerland.[16]

Specification:	Without oil cooling:	With oil cooling:	
Cutting oil temperature	+27°C +80.5°F	+5°C +41°F	+5°C +41°F
Tool life in hours	17	55	more than 36
Hourly output in pieces	7	8.4	12
Efficiency increase: in tool life in output	1 1	3.2x 1.2x	2.1x 1.7x

TABLE II*

Increase of efficiency of CARBIDE tipped tool due to the supplementary cooling of cutting oil, realized at the Tschudin Works in Switzerland.[16].

Specification:	Without oil cooling:	With oil cooling:	
Cutting oil temperature	+43°C +109.5°F	+5°C +41°F	+3°C +36.3°F
Tool life in hours	14 to 16	more than 48	not less than 40
Hourly output in pieces	15	30	40
Efficiency increase: in tool life in output	1 1	3x 2x	2.7x 2.7x

*Data communicated by the Therma Co., Schwanden, Switzerland.

Machinability As a Function of Friction

All of us know very well that machinability may be defined as the relative facility of the cutting operation and that it may be characterized by the hourly output in pieces, tool life in hours and minutes, and surface finish realized. We also know the importance of machinability and its effect on the productivity of every plant and machine shop.[19]

The late Professor Schlesinger in one of his last papers enumerated about 19 factors controlling the cutting of metals. There are surely many more of them and, therefore, the control of machinability is surely not very simple.

Knowledge of applied physics and understanding of modern friction theory give us a foundation for the analysis of many cutting problems and explain to us, in a quite complete manner, a number of cutting phenomena.

The principal difference between **machinability,** when cutting metals, i.e. producing a shape by chip removal, and **workability,** when producing a shape by plastic deformation without chip removal, reposes in the roles played by external and internal friction.

Great **external friction,** i.e. the friction between the cutting or forming tool (die) and the work, is always detrimental whether we are concerned with machinability or workability, because it always involves a rapid tool wear and a poor surface finish. The external friction of rubbing bodies depends upon their microstructure which controls very intimate contact, upon duration of this contact, and upon some other physico-chemical factors controlling the weldability, as well as upon working conditions.

Great **internal friction** of worked metal is of advantage in machining, since a stiff and brittle chip is less deformed when removed. Therefore, brittle materials like cast iron, which give a short chip, breaking when removed, are more easily machined than the tough metals like austenitic steels. On the other hand a great internal friction is a disadvantage for plastic workability by a die.

An explanation of machining phenomena with the help of applied physics reduces the number of factors involved and simplifies numerous machining problems. Applied physics thus gives us a handy guide in our everyday machine shop practice.

—REFERENCES—

The subject of this paper is in its major part contracted from two previous reports of the writer, where the same problems were discussed in more detail, and where the interested reader may find some more bibliographical references.[18, 19] The following references serve for the supporting of developed ideas and for general orientation:

1. Boston, O. W., Gilbert, W. W.,and McKee, R. E., "Influence of Applying Cutting Fluids at Different Temperatures when Turning Steel.", A. S. M. E. Transactions, Paper No. 44 (Jan. 10, 1945).
2. Burwell, J. T., and Strang, C. O., "Radioactive Tracers Reveal Friction and Wear of Metals", Metal Progress (Sept. 1951, pp. 69-74).
3. Dawihl, Walther, "Die Vorgaenge beim Verschleiss von Hartmetallegierungen" ("The Wear up Processes of Carbide Grades"), Stahl und Eisen, No. 9 (Feb. 1941, pp. 210-215).
4. Dawihl, Walther, "Eigenschaften von Hartmetallegierungen und ihr Zusammenhang mit der Verschleissfestigkeit" (Properties of Cemented Carbides and their Relation to Wear Resistance"), Zeitschrift fuer Metallkunde (Sept. 1940, pp. 320-326).
5. Dawihl, Walther, and Rix, Walter, "Ueber den Zusammenhang zwischen Verschleissfestigkeit and Verschleiss bei spanabhebenden-Werkzeugen" ("The Relation Existing between Wear Resistance and Wear Up of Cutting Tools"), Zeitschrift fuer Metallkunde, No. 7 (1942, pp. 156-159).
6. Ernst, Hans, "Physics of Metal Cutting", First chapter of the symposium on "Machining of Metals," American Society for Metals, Cleveland (1938).
7. Ernst, Hans, "Metal Cutting—Art to Science", A chapter of the symposium on "Machining—Theory and Practice," American Society for Metals, Cleveland (1950).
8. Ernst, Hans, "Fundamental Aspects of Metal Cutting Fluid Action", Annals of the New York Academy of Sciences (June 1951).
9. Frazer, W. R., "Raising the Limits of High Speed Steel Machining", Tool Engineer (Mar. 1951, pp. 33-37).
10. Houdremont, Eduard, "Handbuch der Sonderstahlkunde" (Manual on Special Steels"), Springer Verlag, Berlin (1943).
11. Hucks, H., "Plastizitaetsmechanische Theorie der Spanbildung" ("Plastico-Mechanical Theory of Chip Formation"), Werkstatt und Betrieb, Darmstadt (Jan. 1952, pp. 1-6).
12. Martelotti, Mario, "A Treatise on Milling and Milling Machines", Cincinnati Milling Machine Co., Cincinnati, Ohio, (1945 & 1951).
13. Merchant, M. Eugen, "Metal Cutting Research —Theory and Application". A chapter of the symposium on "Machining—Theory and Practice", American Society for Metals, Cleveland (1950).
14. Merchant, M. Eugene, and Ernst, Hans, "Principles of Metal Cutting and Machinability", a chapter of the "Tool Engineer's Handbook", McGraw-Hill Book Co. (1949).
15. Merchant, M. Eugene, and Krabacher, E. J., "Radioactive Tracers for Rapid Measurement of Cutting Tool Life", Journal of Applied Physics (Vol. 22, No. 12, Dec. 1951, pp. 1507-1508).
16. Niedzwiedzki, Antoni, "L'emploi des basses Temperatures dans l'Industrie Mechanique ("Application of Low Temperatures", Canadian Metals (May 1954).
17. Niedzwiedzki, Antoni, "La Theorie de l'Usinage des Metaux et de l'Usure des Outils de Coupe et ses Conclusions practiques pour l'Industrie mecanique" ("Theory of Cutting Metals and of Wear up of Cutting Tools and its Practical Conclusions for Mechanical Industry") Alliance Industrielle, Liege, Belgium (Nov. 1950, pp. 535-543).
18. Niedzwiedzki, Antoni, "La Lubrification dans la Taille des Metaux" ("Lubrication in the Cutting of Metals"), La Machine Moderne, Paris, France, (Mar. 1952, pp. 1-20). Also: Machinery, London (Oct. 9, 1953; Feb. 12, Dec. 10, Dec. 17, 1954).
19. Niedzwiedzki, Antoni, "Le Frottement dans la Taille des Metaux" ("Friction in Cutting of Metals"), La Machine Moderne, Paris, France, (Sept. 1952, pp. 11-33).
20. Niedzwiedzki, Antoni, Patents for a "Tool for Processing Metals", belonging to "Gebruder Bohler & Co. A. G." at Kapfenberg (Steirmark) in Austria, pending in several countries.
21. Pahlitzsch, G., "Verstaerkte Kuhlung bei der Merallbearbeitung" ("Intensified Cooling in Processing of Metals"), Industrielle Organisation, Zurich, Switzerland (Issue 8, 1950).
22. Rapatz, Franz, "Die Edelstaehle ("Special Steels"), Julius Springer Verlag (4th Edition, 1951).
23. Recorder II. "Adhesion of Metals by Cold Welding", Metal Industry, London (Dec. 1, 1950).
24. Schmidt, A. O., "Heat in Metal Cutting" A chapter of the symposium on "Machining—Theory and Practice", American Society for Metals, Cleveland (1950). Also private correspondence.
25. Schmidt, A. O., Gilbert, W. W., and Boston, O. W., "Correlation of coefficient of Friction with the Drilling Torque and Thrust for the Different Types of Cutting Fluids", Transaction of A. S. M. E. (Oct. 1942).
26. Shaw, Milton C., & Smith, Prescott A., "Metallurgical Considerations in Machining". A series of 5 articles, The Machinist, London (Sept. to Dec. 1951).
27. Sinawski, Walden, "HSS, Plus High Rake Angles, Mills Like Carbides", American Machinist, (Apr. 3, 1950, p. 122).
28. Trent, E. M., "Factors Affecting Wear on Cemented Carbide Tools" The Machinist, London (Nov. 3 and 10, 1951).
29. Woldman, Norman E. and Gibbons, Robert C., "Machinability and Machining of Metals", McGraw-Hill Book Co. (1951).

THE PLYMOUTH STORY IN REPRINT FORM

Reader interest in our October issue, presenting the full account of Plymouth's "Qualimatic" V8 Engine Plant, has been terrific. The demand for copies of Industry's top story of 1955 exceeded all expectations.

Our supply of extra copies had disappeared almost before we completed the initial mailing. However, 64-page reprints of the 22 Plymouth articles are now available to our readers.

Each key person in your organization should have the opportunity of reading the inspiring, highly informative, and valuable Plymouth Story. If your own copy of the October issue has disappeared, or if you treasure it too highly to pass on to others, reprints can be obtained.

Address your order to Huebner Publications, Inc., Book Dept., 1975 Lee Road, Cleveland 18. Send personal check with order, or use company purchase order, the reprint cost being $1.50 per copy. Ohio readers should add 3% sales tax.

Improve Your Precision Toolroom Grinding In Three Ways . . . with NEW Cincinnati Filmatic Universal Grinding Machines

It's difficult to improve upon top performance, but it can be done. In toolroom grinding, for example, the new CINCINNATI FILMATIC 12", 14" and 18" Universal Grinders offer three-way improvement:

1—*Improved accuracy.* A new cross feed unit assures closer accuracy than ever before on your precision toolroom work; automatic pickfeed to a positive stop; .000050" minimum increment of adjustment.

2—*Improved convenience of operation.* Table and cross feed handwheels are raised to a more comfortable height. New headstock speed selector is easier to operate. Push buttons are relocated for easier accessibility.

3—*Improved versatility.* Wider selection of quills, spindles and collets for the hinged internal grinding head, a Cincinnati original. Pickfeed at either end or both ends of table cycle. Power rapid positioning (extra) for wheelhead.

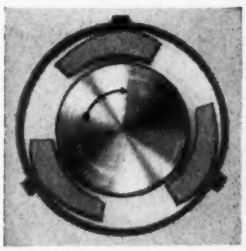
These cost-reducing improvements are in addition to other well-known Cincinnati advantages such as FILMATIC grinding wheel spindle bearings. That's why CINCINNATI Universal Grinders are your best buy. Get all the facts by writing for catalog No. G-663.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

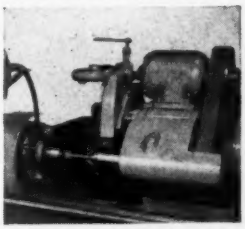
CINCINNATI

FILMATIC

Power rapid positioning . . . eliminates tiresome hand cranking from one diameter to another.



FILMATIC grinding wheel spindle bearings...never wear out; never require adjustment.



Internal grinding head . . . permanently mounted on wheelhead, always ready for the job.

Cross feed unit . . . completely new; two-speed; pickfeed all the way to final size.

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1031

A. A. Gage Designs Multi-Purpose Marking Machine

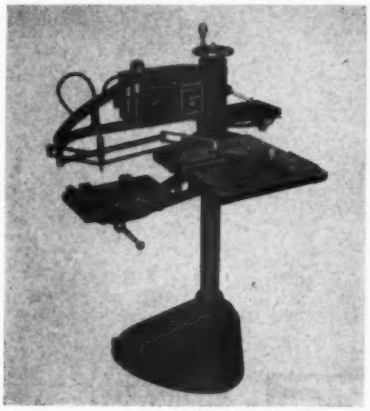
The versatile "Panto Marker" is designed to mark soft and hardened materials, plastics, and fibers. This machine uses various methods including electric etch, vibro etch, acid etch, and engraving.

The "Panto Marker" employs all of these methods, each one of which previously required a device exclusively for that particular purpose. There is great economy since only one unit serves all requirements.

A font of letters and characters are furnished from which inscriptions can be arranged. By tracing them, the inscriptions are transferred by this pantography arrangement to the stylus or diamond point and impressions made on the object to be marked. Markings can be made in a range of sizes from 1/32" to 3/16" in height.

This multi-purpose marking machine features wide capacity and yet is compact. The work table will accommodate a maximum part up to 32" high with unrestricted width.

The A. A. Gage Co., 350 Fair St., Detroit 20, manufactures the "Panto Marker." **Inform-A-Gram No. D1.**



Get Into Production Quicker on Every Job

Buck®
AJUST-TRU

AIR CHUCKS

You can save from several minutes to many hours on every set-up for your chucking machines with the Buck Ajust-Tru power chuck.

Jaws can be machined in the tool room—and hardened if you wish—since there is no need for extra machining on the turret lathes to fit jaws to the work. Final accuracy adjustments are made by the chuck . . . *in a matter of minutes* . . . holding work under full air pressure!

Jobs can be run intermittently *without re-truing jaws.* On new runs and re-runs accuracy within .001" is guaranteed.

You can make drastic cuts on down-time with Buck air chucks. Write for full details today.

Hardened Key Ways Standard Feature

Hardened key ways of the Buck, combined with hardened jaws, let you run thousands more pieces (holding tolerances within .001") than conventional chucks. You can use hardened jaws for all operations since final accuracy adjustments are made by the chuck. No need to grind and fit jaws on the chucking machine. Hardened key ways are a *plus* feature of the Buck, at no additional cost.

Buck Air Chucks are made in 6", 8", 10", 12" diameters —2 or 3 jaws. NO PRICE PREMIUM.

BUCK TOOL COMPANY
1218 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1041

High Speed Hopper-Counter

The versatile, high speed "Feed-A-Matic" hopper and counter manufactured by U. S. Engineering Co. can be used to orientate and feed up to 200,000 parts per hr. for assembly or machine operations. Exact speed of operation depends on part size.

By providing mechanical release fingers or an electronic system, it can be used for packaging small or large counts of items such as fasteners, screw machine parts, bolts, or die cast, plastic, or electrical parts.

The unit consists of a cast iron or aluminum barrel with cast-in pockets. As the barrel revolves, the items slide into the pockets. There they

are trapped by a stationary plate which gradually covers more of the pocket opening as the pocket revolves to the top position. At this point the plate ends, allowing the parts to flow down a chute which orientates them. Parts not properly orientated are rejected back into the hopper by means of a revolving wheel.

Get detailed information from U. S. Engineering Co., 40-21 22nd St., Long Island City 1, N. Y., or — **Circle Inform-A-Gram No. D-2.**

Word has been received of the death of Alvan F. Larrabee, president and director of the Detroit Power Screwdriver Co. for 30 years. Mr. Larrabee died Oct. 31.

ATOMIC TERMS

ATOM — The smallest particle in which basic elements exist, consisting of a core or nucleus made up of protons, neutrons, and anti-protons, around which rotate negatively charged electrons.

URANIUM — The heaviest element found in nature. It has two chief kinds of atoms — U-235 and U-238 (the numbers refer to their weight in comparison to the simplest atom of hydrogen, used as the basis for measurement).

ATOMIC ENERGY — When enough uranium-235 atoms are brought together, a "chain reaction" occurs. Neutrons from within the atom shoot out and smash other U-235 atoms. These, in turn, are split and their locked-up energy is released.

REACTOR — An "atomic furnace" designed to keep the chain reaction under control in order to make use of the tremendous amount of radiation and heat produced by the splitting atoms.

ISOTOPES — Almost identical atoms. Two or more kinds of atoms have been found in the same element that behave the same chemically but have slight differences in their atomic weights.

RADIOISOTOPES — Radioactive isotopes. Unstable atoms that give off energy in the form of radiation and disintegrate to become other kinds of atoms. Some elements are naturally radioactive (uranium-235 and radium-226), while others are produced artificially by placing the elements in a reactor and bombarding them by flying neutrons produced in the reactor. The types of radiation particles involved when unstable atoms disintegrate are listed below.

ALPHA RADIATION — During the change or disintegration, the atom shoots out a heavy alpha particle, containing two protons and two neutrons. Alpha radiation is not penetrating.

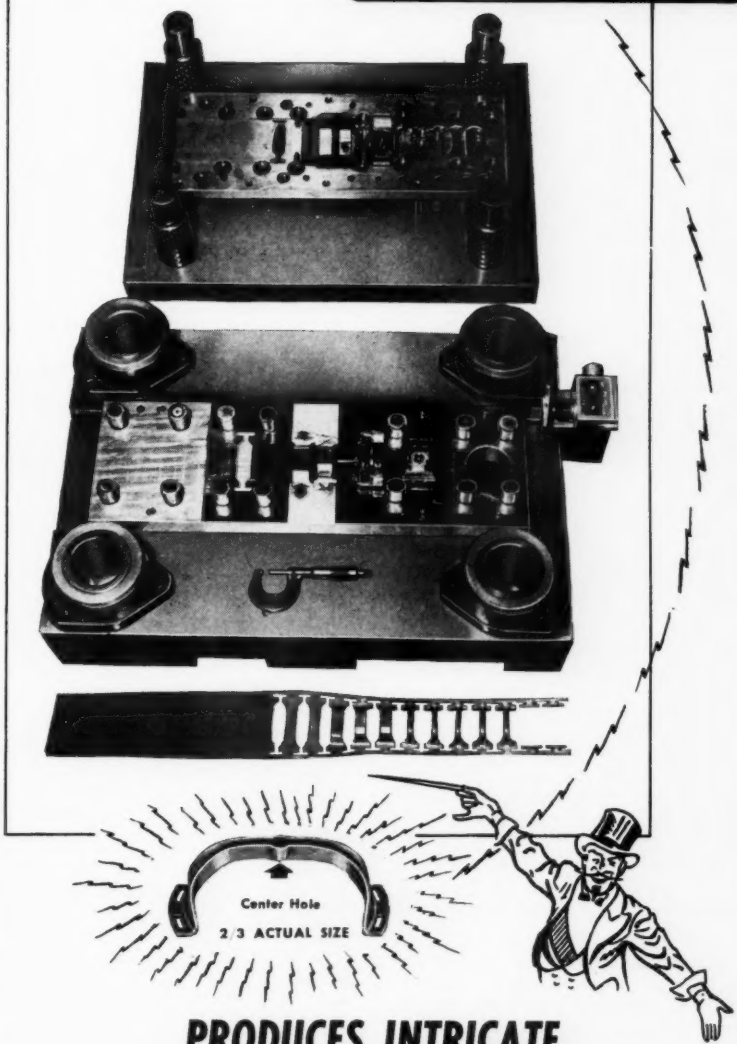
BETA RADIATION — Electrons shoot out from the atom. Beta radiation is more penetrating than alpha radiation and is useful in tracer work.

GAMMA RADIATION — A flash of light shoots from the atom. Gamma rays are similar to X-Rays and are extremely penetrating.

CURIE — A measure of the number of atoms disintegrating in a sample per minute. Important when ordering radioactive materials.

ROENTGEN — The unit used to measure the amount of radiation received by an object.

MICROSWITCH-CONTROLLED
BARTH DIE



PRODUCES INTRICATE
THERMOSTAT STRAPS
with never a mis-hit!

THIS 13 STATION BARTH DIE, made entirely from high carbon-high chrome steel, produces this intricate thermostat strap from strip brass at high speed in six working and seven idle stations. A novel arrangement operated in conjunction with a microswitch assures proper positioning of the feed strip, or halts the press thereby preventing any mis-hits.

STATIONS
1 Notch, 2 and 3 Idle, 4 First Form, 5 Intermediate Form, 6 Final Depth Form, 7 Form Flange, 8 Idle, 9 Pierce 4 Flange and 1 Center Holes, 10 and 11 Idle, 12 Blank Through, 13 Cutoff.

The BARTH Corporation
Serves the Nation • 12650 BROOKPARK ROAD • CLEVELAND 30, OHIO
MANUFACTURING · DESIGNING · ENGINEERING
DIES · FIXTURES · SPECIAL MACHINES · UNIT ASSEMBLIES · AUTOMATION · SERVO MECHANISMS · STAMPINGS

CIRCLE INFORM-A-GRAM KEY NO. 1061

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Hole-Punching Equipment for unitized tooling in presses and press brakes is described in a bulletin from Punch Products. The complete line of Series "A" units permits punching round and shaped holes to 1½" dia. in thin material and to ¼" in thick mild steel sheets. Diagrams and specifications on these units are contained in Bulletin G-1. Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y., or —
Circle Inform-A-Gram No. B1.

"Right Off The Shelf" features the Star line of stainless steel fastenings that are available from stock. Included are nuts; washers; and machine, cap, and sheet metal screws. All are shown with diagrams and charts of sizes to facilitate ordering. One section is devoted to corrosion resistance tables and another to standard stainless steel specifications. Contact Star Stainless Screw Co., 699 Union Blvd., Paterson 2, N. J., for copies of Catalog 55-A, or —
Circle Inform-A-Gram No. B2.

Why Howell Series 100 Motors Are Smaller, lighter, and cooler running is told in a full-color catalog. The explanation is aided by cut-away illustrations and diagrams. Both totally enclosed fan-cooled and open drip-proof types of integral horsepower motors are detailed, and other enclosures and mounting variations covered. Howell Electric Motors Co., Howell, Mich., will supply copies of Bulletin N-100-R, or —
Circle Inform-A-Gram No. B3.

"Automatic Process and Transfer Equipment" uses photographs, line drawings, diagrams, and brief text to describe 20 materials handling and special process units. Featured is a fold-out section with a diagram of a cylinder block production line showing how the units are incorporated into a specific line. W. F. & John Barnes Co., Process Equipment Div'n, 369 S. Water St., Rockford, Ill., or —
Circle Inform-A-Gram No. B4.

Metal Spinning, deep drawing, stamping, and fabricating are handled by Spincraft facilities. The company offers a broad combination of services for design and product engineers. They're listed in a Spincraft bulletin together with illustrations of the many products that can be produced. The advantages of the metal spinning process and its requirements are also discussed. Get the bulletin from Spincraft Inc., 4157 W. State St., Milwaukee 8, or —
Circle Inform-A-Gram No. B5.

Obtain a 0.0005" Hole Location in three minutes with a new edge finder. It provides a faster, more accurate method of locating holes than to lay them out. This edge finder is ideal for locating holes in drill jigs, dies, tools, and machine parts. For a brochure with full details, contact Glover Mfg. Co., 736 Mohican Pl., Meadville, Pa., or —
Circle Inform-A-Gram No. B6.

Eliminate Long Costly Set-Up Sessions, insecure clamping, and damage to work or work surfaces with a new strap clamping principle. Twelve complete clamp assemblies, each available in a number of sizes for every application, are illustrated in a work clamping folder from Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland.
Circle Inform-A-Gram No. B7.

Tools – and operators – keep their tempers with Norton wheels

Only Norton builds these value-adding, time-saving "TOUCH of GOLD" features into wheels for tool room grinding

All teeth stay the same height when you sharpen milling cutters with long wearing, free cutting Norton G Bond wheels that hold size all the way round. The machine is a Norton No. 20 Cutter and Tool Grinder.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

An "All-Angle" Milling Attachment is described in a new Axelson bulletin. Type 30 precision milling attachment is suited for milling, drilling, boring, reaming, and grinding operations. It rotates 360° around the overarm, and 90° forward or back. Complete details are found in Bulletin 5502-M from Axelson Mfg. Co., Los Angeles 58, or —
Circle Inform-A-Gram No. B8.

Increase Cutter Speeds and Feeds with Jergens live sealed roller bearing units. With these units, it is possible to utilize the full capacity of carbide tools and machines by having maintenance-free outer supports. All the features and details are listed in a flyer from Jergens Div'n, Donley Products, Inc., 11106 Avon Ave., Cleveland 5, or —
Circle Inform-A-Gram No. B9.

"Motors and Drives for the Machine Tool Industry" contains information on the special and standard motors and adjustable drives produced by The Louis Allis Co., Milwaukee 7. Comprehensive descriptions and photos provide data on more than 15 motors and drives. Bulletin 1750 also covers installations and electrical features.
Circle Inform-A-Gram No. B10.

NORTON GENERAL PURPOSE WHEELS

Out-of-the-ordinary wheels for your ordinary bench or floor stand grinding. Available in the abrasive-and-bond combinations you need for economical, trouble-free performance. Chances are that any tool wheel or general purpose wheel you require is carried in stock.

Exclusive precision processing gives Norton tool room grinding wheels unusual advantages, including controlled uniformity and built-in balance, that reduce vibration and assure smoother running wheels.

Plus The Famous G Bond

Also, you can get these wheels in the most efficient vitrified bond ever produced — the Norton G Bond, developed especially for precision-grinding the hardest tool steels. G Bond wheels: *cut freer, cooler, faster . . . do more work per wheel . . . hold corners better, are better for form grinding, dress easier and grind more pieces per dressing.*

And for rapid stock removal, with especially cool cutting action, Norton 32 ALUNDUM* abrasive is outstandingly popular. All G Bond wheels reduce tool spoilage, give you closer tolerances and smoother finishes, with fewer wheel changes and machine adjustments — additional "Touch of Gold" benefits that mean better performing tools and better, lower-cost tool room grinding.

For Your Carbide Grinding

Norton diamond wheels, carbide grinding's recognized "Crown Jewels", are made in all required bond types. Their accurate cutting action and extra long service life bring you top savings in every single point and multi-tooth carbide grinding application. Also available are CRYSTOLON* wheels green or gray — with the cost-cutting K Bond.

See Your Norton Distributor

Or write direct. And remember: only Norton brings you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1661

NORTON

Making better products... to make your products better

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

CIRCLE INFORM-A-GRAM KEY NO. 1071

Can Machinery — flangers, beaders, and thread rollers are highlighted in a 20-page illustrated catalog. Design and construction features of all the machines are described and dimensions listed. The machinery is used for medium and high speed can making lines. For copies of Catalog 36B, contact E. W. Bliss Co., 50 Church St., New York 7, or— **Inform-A-Gram No. B11.**

"Air-O-Limit" Comparators are highlighted in a Pratt & Whitney circular. The advantages of pneumatic gaging are listed and explained. Photos and diagrams present the various models of comparators and attachments that are available. One section deals with special applications of the comparators, and another discusses automation gaging. Actual size standard scale layouts are also included in Circular 586 from Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or —
Circle Inform-A-Gram No. B12.

Special High Speed Circuits have been developed having speed and accuracy requirements in excess of the capabilities of contact making meters. These circuits are used for high speed inspection, sorting, and control operations involving size and weight. The circuits are discussed in "LVDT Measurement and Control Systems" from Daytronic Corp., 216 S. Main St., Dayton 2, O., or —
Circle Inform-A-Gram No. B13.

Four Classes of Precision Barrel Finishing Compounds are discussed in a set of four illustrated brochures. The compounds are used for heavy deburring and cutting as well as regular deburring, burnishing, and cleaning. In addition, rinsing and neutralizing compounds for between-stages operations are covered. Complete with guide tables, the set of "Newton Compounds of Precision Barrel Finishing" Class A, B, C, and D brochures is available from Newton Industries, Inc. 100 Saw Mill Rd., West Haven, Conn., or —
Circle Inform-A-Gram No. B14.

"Molykote", Type BR2, a general purpose grease with extreme bearing pressure properties, is described in a bulletin from The Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn. Bulletin 101 lists its ten outstanding qualities and gives test data and physical specifications.
Circle Inform-A-Gram No. B15.

Quick Change Holders and Adaptors and standard machine tool accessories are featured in a Beaver Catalog. One section is devoted to engineering data such as horizontal boring mill spindle specifications and bolt circle hole layout. The complete line of quick change and standard machine tool accessories are listed in Catalog 55 released by Beaver Tool & Engineering Corp., Box 429, Royal Oak, Mich.
Circle Inform-A-Gram No. B16.

The Advantages of Weldments in cutting costs, improving appearance, and saving weights are outlined in a six-page folder. Examples of weldments and weldment-casting combinations ranging from 1625 to 27,000 lbs are illustrated in Bulletin 601. The Enterprise Co., Columbiana, O., or —
Circle Inform-A-Gram No. B17.

GRINDING TIME CUT 50%

New Rotor D-4S Air Grinder pays for itself in 12 weeks

Job: Grinding defects in holes of castings with cone wheel (size 2¼" x 3½" x ⅛"). Formerly used 3600 rpm electric grinder (3 phase, 220v.). Job took 8 minutes—too slow.

Solution: Rotor Application Engineer suggested changing to Rotor D-4S Cone Grinder—speed 8500 rpm.

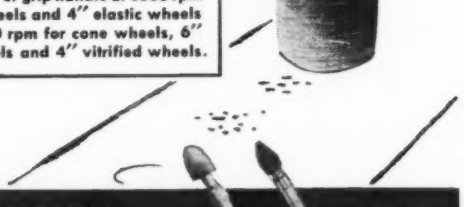
Results: Saves 4 minutes per casting; doubles output. With 50% use factor, savings paid for new Rotor Grinder in 12 weeks. Wheels last longer. Tool is lighter (only 8¼ lbs.); easier to handle. No tool stalling—even when crowded in hole.

Get the Rotor Engineer on *your* portable tool jobs to save *you* money!

APPLICATION

Rotor D-4 Air Grinders are available with straight or grip handle at 8500 rpm for cone wheels and 4" elastic wheels and at 6000 rpm for cone wheels, 6" elastic wheels and 4" vitrified wheels.

ASK FOR BULLETIN 43



THE ROTOR TOOL CO.
CLEVELAND, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1081

"Quick-Seal Couplings" features page-size cut-away views of the couplings to show the design and construction. Also described are single-check and double-check valve modifications which seal off one or both ends of a fluid line when the coupling is disconnected. Tables give information on the selection of seals for different coupling sizes and safe operating pressures for each size. For copies of the revised coupling catalog, write to Titeflex, Inc., Industrial Sales, 10 Hendee St., Springfield 4, Mass., or —
Circle Inform-A-Gram No. B18.

Power Tools for cutting, shaping, drilling, and finishing metal and plastics are featured in a catalog released by Boice-Crane Co., 963 Cen-

tral Ave., Toledo 6, O. Among the tools described in Catalog 55 are jointers, planers, band saws, drill presses, and shapers.
Circle Inform-A-Gram No. B19.

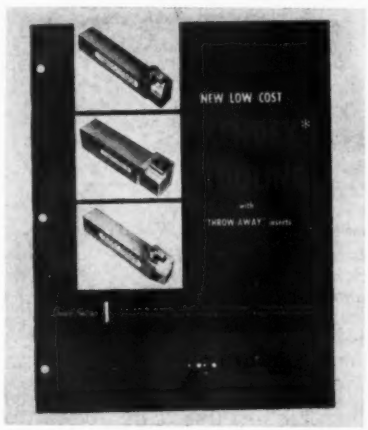
Intended Primarily For Wet Grinding is Triple C grinding coolant, available in liquid or crystalline form. In addition to the coolant, Triple C machine cleaner is described in a new bulletin. Copies of Bulletin 103-CT are supplied by The Motch & Merryweather Machinery Co., 1250 E. 222nd St., Cleveland 17, or — **Circle Inform-A-Gram No. B20.**

Prevent Damage To Tools by using a Kemp desiccant type dryer to dry air where compressed air tools require dry air. A 40-page bulletin presents the complete line of dryers with detailed flow diagrams and evaluation drawings to show their operation. An engineering reference data section contains seven charts and tables related to desiccants, pressure drop, gas velocity, and temperature. Bulletin D-100 is obtainable from The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md., or — **Circle Inform-A-Gram No. B21.**

"Ostuco Tubing" describes four major classifications of carbon and alloy steel tubing — mechanical, pressure, airframe, and aircraft mechanical. It covers both seamless and electric resistance welded tubing as well as tube fabricating and forging. Applications of the tubing include bending, flaring, expanding and reducing, swaging, upsetting, and spinning. Copies of the bulletin may be obtained from Ohio Seamless Tube Div'n, Copperweld Steel Co., Shelby, O., or —
Circle Inform-A-Gram No. B22.

Automatic Turret Lathes, 6 Dre-40 and 6 Dre1-40, produced by Potter & Johnston give increased production at lower cost. Their features are illustrated and explained in a new bulletin. Applications of both machines are presented in diagrams. Potter & Johnston Co., Pawtucket, R. I., will provide copies of Bulletin 159, or — **Inform-A-Gram No. B23.**

"Kendex" Tooling featuring 17 "throwaway" insert styles is highlighted in a Kennametal booklet. It illustrates how "Kendex" tooling eliminates all grinding, cuts cost per cutting edge, indexes in seconds, and



provides a new chip control system. These inserts have up to eight cutting edges per insert. For copies of Form B-300, contact Kennametal Inc., Latrobe, Pa., or —
Circle Inform-A-Gram No. B24.

"Handbook on Boron Carbide and Elemental Boron" contains technical information on materials made by Norton for use in the atomic energy field. Among the subjects covered are boron for neutron absorption, commercial grades of boron carbide, radiation damages to boron carbide, boron nitride, and metal borides. Also included are neutron absorption cross-sections. The illustrated booklet is a useful reference for scientists and technicians in the atomic energy field. Norton Co., Worcester 6, Mass., or —
Circle Inform-A-Gram No. B25.

Used for Die Casting Aluminum, the Duplex "Ajaxomatic" melts, holds, and automatically pours molten aluminum. The new combination induction furnace features three electric control units. Folder R-48 contains photos of the "Ajaxomatic" in operation and an installation diagram. Ajax Engineering Corp., Trenton 7, N. J., or —
Circle Inform-A-Gram No. B26.

"How Wire Construction Reduces Costs" is a study of 36 products showing how redesign with wire cuts costs. Descriptions of each before-and-after picture point out specific advantages of wire construction. The advantages include reduced weight, simplified design, improved appearance, and noise and vibration reduction. E. H. Titchener & Co., 67 Clinton St., Binghamton, N. Y., or
Circle Inform-A-Gram No. B27.

Increase Production, reduce chatter and improve quality by using a new boring bar introduced by Cyma Corp., 3581 Kipling Ave., Berkley, Mich. The boring bar has tungsten carbide stiffening. Complete details are given in a technical bulletin from the company.
Circle Inform-A-Gram No. B28.

8419

PRECISION GEARS

YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.

YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.

The Hamilton Precision Gear Hobber, the hobber with a "reserve of accuracy," regularly holds work spindle and hob spindle runout to less than .0002", workspindle and tailstock spindle alignment to less than .0002", and this workmanship is maintained throughout the machine.

WANT FACTS?
Write for Bulletin No. 5419.
Address The Hamilton Tool Company
832 South Ninth Street,
Hamilton, Ohio.

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1091

The Features of the No. 4 Universal Turret Lathe are illustrated and discussed in detail in a circular from Bardons & Oliver. Also given are the specifications. Bardons & Oliver, Inc., 1133 W. 9th St., Cleveland 13, or —
Circle Inform-A-Gram No. B29.

Capacity Tables for Red Ring gear checking machines are included in a catalog from National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13. Information dealing with the mathematics of making sine bar settings is also presented. In addition, universal gear checkers having five standard interchangeable measuring heads for checking various dimensions of external spur and helical gears, are described in Catalog C55-9.
Circle Inform-A-Gram No. B30.

Standard Tube Burring Tools are featured in a new bulletin. The tools are designed to face end, and chamfer O.D. and I.D. of standard tubing. Details, specifications, and pricing information are given in the Bulletin from Genesee Mfg. Co., 566 Hollenbeck St., Rochester 21, N. Y., or —**Circle Inform-A-Gram No. B31.**

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● Better production machining methods at Seibert today make it possible to manufacture, in quantity, holding tools of improved quality without increased cost to you. The Seibert Shur-Lock adjustable adapter is one illustration. They are manufactured to precision tolerances from the highest quality hardened alloy steel, to give you the best in holding tools — certain to cut set-up time and give long service life. In addition, they are produced more efficiently than ever before which makes it possible to supply your needs promptly and at reasonable cost. Quality, Service and Price are the three reasons hundreds of users are today specifying Seibert tools. It will pay you to investigate the advantages of standardizing with Seibert.

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Convenient starting ring for easy installation
Relieved key seat for easier setups—eliminates swell
Total concentricity held to .002" (total indicator reading) 6" from end of tool
Precision ground threads for accurate adjustment

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Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1101

Metalworking Presses and their applications are discussed complete with installation illustrations and tables of specifications, in Bulletin 3201. They're used for extrusion, metal forming and drawing, forging, bending, flanging, and crimping and straightening. A table shows capacities for 1" to 60" dia. press rams at various hydraulic pressures, the quantity of hydraulic fluid needed per inch and foot of ram travel, and pump hp requirements per gal. per min. Baldwin-Lima-Hamilton Corp., Philadelphia 42, or **Circle Inform-A-Gram No. B32.**

Eliminate Work Spoilage, Stripped Threads, and sheared fasteners by using air screwdrivers and nutrunners with the "Magnamatic" one-shot clutch that maintains the selected torque setting. A bulletin discusses the various applications in terms of how "Magnamatic" standardizes torque results and how it surpasses other methods of maintaining uniform tightness. The complete line of "Magnamatic" screwdrivers and nutrunners is presented in Bulletin SP-3126-2 issued by Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, or —
Circle Inform-A-Gram No. B33.

Automatic Thread Grinders are high production automatic machines for grinding accurate external threads. Styles 33 and 33-L will handle work up to 6" dia. A new bulletin pictures a variety of aircraft engine parts, taps, thread chasers, lead and adjusting screws, worms, and other workpieces produced by the two machines. The machines their construction features, and operation are illustrated and described in Bulletin 481051 available from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. or —
Circle Inform-A-Gram No. B34.

Automatic Multiple-Way Machine Tools are illustrated and described in a catalog. They're used for drilling, reaming, tapping, facing, and milling operations. W. F. & John Barnes Co., 301 S. Water St., Rockford, Ill., or —
Circle Inform-A-Gram No. B35.

Production Advantages possible with a tracer lathe design that features top mounting of both the tracer slide and template are covered in a four-page bulletin. The "Hydra-Feed" tracer lathes are used for high production copy turning operations. Some typical jobs performed on these machines are illustrated and explained briefly in Bulletin HDT-55 from Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale, Mich.
Circle Inform-A-Gram No. B36.

Close Tolerance Work is handled by the Thompson Type D hand fed surface grinder. Catalog D55 from The Thompson Grinder Co., Springfield, O., has an illustration showing the construction features of the grinder and text discussing them. Also included are clearance diagrams, a floor plan, and specifications. **Circle Inform-A-Gram No. B37.**

Diamond Dressers are featured in an Industrial Diamond Tool Catalog. The catalog has illustrations and specifications covering tool dressers, thread grinding dressers, and center cones. Included are the correct procedures for wheel dressing and

tool reconditioning methods. There's also information on a newly developed diamond setting machine, the Prestalloy Diamond Automation. Diamond Products, Inc., 326 Prospect Ave., Elyria, O., or —
Circle Inform-A-Gram No. B38.

Spring Loaded Live Centers are used for precision turning and grinding. They feature greater load capacity, automatic thrust adjustment, longer life, and faster speeds. Also described in a new bulletin are bell head adaptors that reduce production costs and increase speed and accuracy. Details on the centers and adaptors are given in a bulletin supplied by Concentric Tool Corp., 2486 Huntington Dr., San Marino, Calif., or —
Circle Inform-A-Gram No. B39.

An Automatic Tracer-Controlled Milling Machine will reproduce the shape of a 2-dimensional template or 3-dimensional full model. The Keller BL 3622 Model C can produce complex irregular shapes — dies, molds, and prototype and production parts. Circular 588 from Pratt & Whitney Co., Inc., W. Hartford 1, Conn., tells all about the machine. **Inform-A-Gram No. B40.**

Manco "Guillotine" High-Pressure Hydraulic Tools are used for cutting, punching, riveting, and shearing. A comprehensive catalog presents the entire line complete with photos. The catalog is divided into sections according to the work that the tools will perform. Manco Mfg. Co., Bradley, Ill., will provide copies of Catalog 155, or —
Circle Inform-A-Gram No. B41.

Indox, a new ceramic material, is hard, brittle, lighter in weight than magnets made of metallic alloys, and a non-conductor. It's an excellent permanent magnet material. Indox I and ceramic permanent magnets are discussed in a catalog from The Indiana Steel Products Co., Valparaiso, Ind. Tables presenting the magnet stock sizes, ordering information, and illustrations are included in Catalog 15.
Circle Inform-A-Gram No. B42.

Six Models of Kodak contour projectors are described in a new catalog prepared by Eastman Kodak Co., 343 State St., Rochester 4, N. Y. The use of optical gaging is also discussed. The catalog is complete with specifications and accessories.
Circle Inform-A-Gram No. B43.

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ONE MAN CREW
WITH PORTELVATOR®
THE HANDY HAMILTON PORTABLE ELEVATING TABLE

One man can lift, lower, and transport compact, heavy loads which, without Portelvator, would require the combined strength of three or more men.

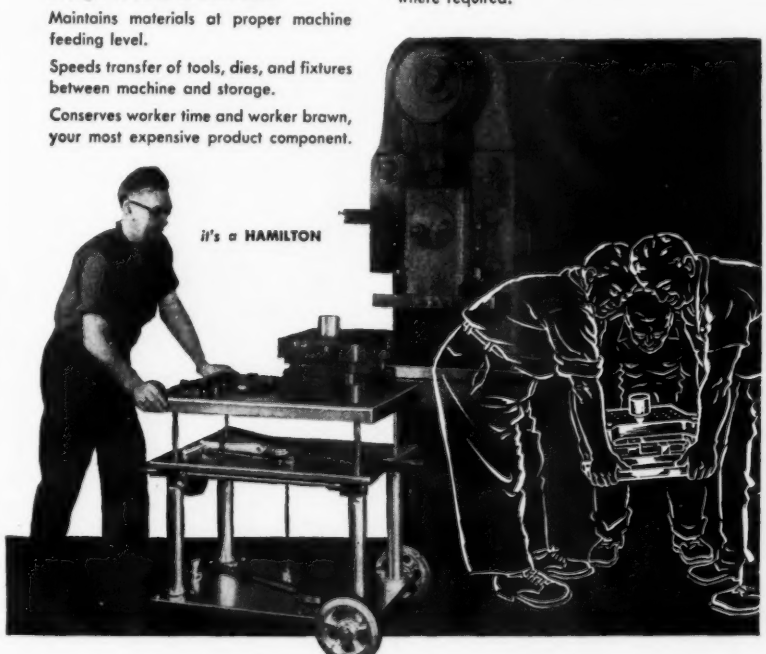
Maintains materials at proper machine feeding level.

Speeds transfer of tools, dies, and fixtures between machine and storage.

Conserves worker time and worker brawn, your most expensive product component.

Reduces injuries to workmen, and damage to tools and materials due to manual handling.

Provides a portable work bench when and where required.



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832 South Ninth Street, Hamilton, Ohio

IT'S A Hamilton Tool
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CIRCLE INFORM-A-GRAM KEY NO. 1111

Two Heat Resistant Super Alloys are featured in "Uniloy 19-9DL and Uniloy 19-9DX". Information on fabrication and welding Uniloy 19-9DL is included in addition to technical data like corrosion resistance, thermal conductivity, and damping capacity. Results of impact tests are detailed in charts. Tables show short time tensile properties for 19-9DX bar stock and sheet and light plate, the results of impact tests, and stress rupture properties. Get copies from Universal-Cyclops Steel Corp., Bridgeville, Pa., or — **Circle Inform-A-Gram No. B44.**

An Air Clutch Parts Catalog is available from Ferracute Machine Co., Bridgeton, N. J. A numbered diagram shows the parts for the Ferracute air clutch that are carried in stock and aids in ordering them. **Circle Inform-A-Gram No. B45.**

Automatic Process Control of machine tools provides statistical quality control for accurate uniform production. Read all about a new process controller in a folder from Bryant Chucking Grinder Co., Springfield, Vt., or — **Circle Inform-A-Gram No. B46.**

The intermeshing sleeves support the punch throughout its entire length. Result?

1. **The Punch CANNOT buckle**
2. **The Punch CANNOT shift off center**
3. **Perforates thru metal many times thicker than hole diameter.**

All Durable Punches are vertically lapped, then electrocoated — Result—easier stripping, no galling, longer punch life.

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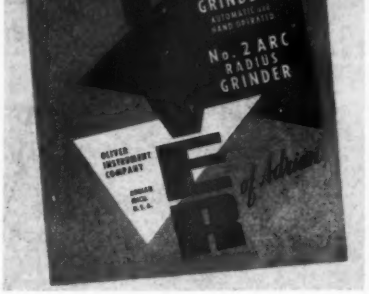
CIRCLE INFORM-A-GRAM KEY NO. 1121

Remove Ferrous Metal Chips and sludge from machine tool coolants with a Houdaille magnetic separator. The small unit can be installed on machine tools performing ferrous metal roughing and finishing operations. Read all about the magnetic separator in Bulletin 601 from Houdaille-Hershey of Indiana, Inc., 248 Superior Ave., Lebanon, Ind., or — **Circle Inform-A-Gram No. B47.**

The Complete Line of Face Mill Grinders is featured in a 12-page bulletin from Oliver Instrument Co., Adrian, Mich. The machines grind



face milling cutters to a shape, quickly and accurately. The new bulletin discusses their features, setup, applications, and specifications. **Circle Inform-A-Gram No. B48.**

A Transparent Cutting Oil is described in a new bulletin. "Sunicut 5534" is designed for use on a wide variety of steels. This non-emulsifying oil can help reduce downtime in jobbing and screw-machine shops. Copies of Technical Bulletin 39 may be obtained by writing to Sun Oil Co., Philadelphia 3, or — **No. B49.**

To Speed Drilling Time, use the Vilter "Tru-Hole Speedy" drilling attachment. With this attachment, drill breakage, downtime, and scrap are reduced. It is used for accurate drilling of centers and drilling small deep holes in turret lathes or hand screw machines. Read all about it in a bulletin from E. F. Vilter Sales Inc., 4161 N. Richards St., Milwaukee 12, or — **Inform-A-Gram No. B50.**

Sectional-Pole Heavy Duty Control Relays are described in a bulletin from Clark Controller Co., 1146 E. 152nd St., Cleveland 10. Type "PM" 10-amp magnetic relays cccupy minimum panel space. Ten models are pictured complete with dimensions, enclosures, features, and data on maintenance and pole conversion, in Bulletin PL 7305-PM. **Circle Inform-A-Gram No. B51.**

Vertical Universal Grinders produced by Springfield open a field of grinding in which extreme micro-inch finish is combined with economical operation. Bulletin 197 showing and explaining their features may be obtained from The Springfield Machine Tool Co., Springfield, O., or —
Circle Inform-A-Gram No. B52.

Alloys and Fluxes for Work on Steel are covered in a new folder. This folder aids in quick selection of the right alloy and its companion flux and tells how to apply it for best results. All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y., will supply copies of "How to Use and Apply All-State Alloys and Fluxes for Welding, Brazing, Soldering, and Cutting Steel".
Circle Inform-A-Gram No. B53.

A Complete Line of Notching Presses and attachments is described in a 16-page illustrated catalog issued by The V & O Press Co., Div'n Emhart Mfg. Co., Hudson, N. Y. Catalog 55 contains detailed press

and fixture specifications for three notching machine models, two types of segment notchers, a slotting machine, and a band punching machine. **Inform-A-Gram No. B54.**

Cylindrical and Thread Gages are now offered to the metalworking industry by Standard Tool. A new catalog gives the sizes and prices of the gages, for both plug and ring types. Supplemental tables give dimensions, screw thread product limits, and tolerances. Standard Tool Co., 3950 Chester Ave., Cleveland 14, will issue copies of Catalog 355, or — **Circle Inform-A-Gram No. B55.**

Typical Applications using honing machines are shown in a catalog from Sunnen. They're used in metalworking for sizing and finishing internal diameters and for work in plastics. Get Bulletin X-SP-5056A from Sunnen Products Co., 7910 Manchester, St. Louis 17, Mo., or **Circle Inform-A-Gram No. B56.**

Developed to Handle Heavy-Duty Horsepower Drives Efficiently are Veelos TD and TE adjustable v-belts. The features and specifications of these patented v-belts together with photos of typical applications and installation directions are found in a catalog from Manheim Mfg. and Belting Co., Manheim, Pa., or —
Circle Inform-A-Gram No. B57.

Abrasive Discs and Cylinder Wheels are featured in a 20-page catalog. A chart shows the variable factors influencing the selection of abrasive discs and cylinder wheels. Also described are the types and sizes of abrasives manufactured to meet the various flat surface grinding requirements. The catalog, "Gardner Abrasive Discs", AC-55, may be obtained from Gardner Machine Co., Beloit, Wis., or —
Circle Inform-A-Gram No. B58.

Automatic Cycling is one feature of the Blanchard surface grinder. Its other advantages are illustrated and discussed in Form 340 from The Blanchard Machine Co., 64 State St., Cambridge 39, Mass. One page shows the work that can be done on the No. 18-C grinder.
Circle Inform-A-Gram No. B59.

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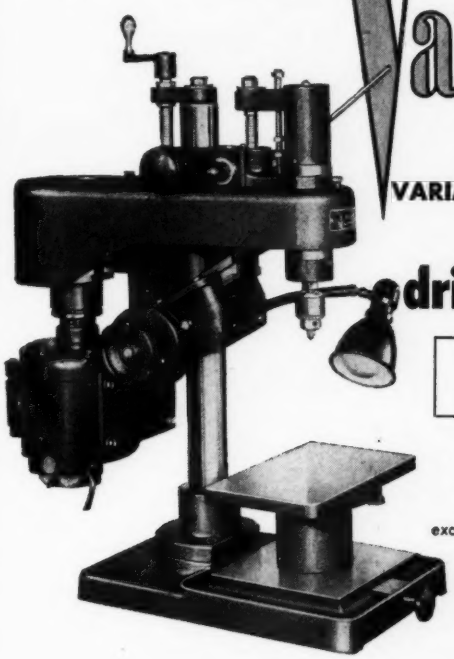
SUPER SENSITIVE
VARIABLE SPEED • SMALL HOLE
PRECISION
drilling machine
SINGLE OR MULTIPLE SPINDLES
to drill holes (.004" to 5/16") in all drillable materials, to the most exacting specifications and on the most relentless production schedules.



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CIRCLE INFORM-A-GRAM KEY NO. 1131

MEN YOU SHOULD KNOW

Herbert Ashcroft, Jr., has been appointed works manager of Bausch & Lomb Optical Co. He'll be responsible for all manufacturing operations, including the engineering and maintenance division, and process development.

◆

Percy L. Spencer, vice president of Raytheon Mfg. Co., and general manager of its microwave and power tube operations, has been elected a director of the company.

John E. Hawley has been assigned to the Technical Service Dept. of the Chemical Specialties Div'n of Pennsylvania Salt Mfg. Co.

◆

George A. Tinnerman, president of Pneuma-Serve Inc., has announced the promotion of **Neil B. Burdette** to chief engineer, and **Elmer J. Knitter** to production manager. Both men had formerly been with Ford Motor Co. in Cleveland, as equipment designers.

True Economy in Thread Gaging Calls For

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CARBIDE THREAD PLUG GAGES

The largest gage illustrated is a carbide buttress thread plug gage of 5½" diameter—12 pitch. It serves as a good example of Lincoln Park's ability to meet special thread gaging requirements. Or, when customers' needs are for standard carbide thread gages, Lincoln Park offers a complete range of types and sizes.

The manufacture of thread plug gages has been a Lincoln Park specialty for many years. In fact, this company was the first to successfully utilize cemented-carbides for such products. It is this unequalled experience that assures you of gages of unquestioned accuracy and maximum service life.

Let us send you full information on Lincoln Park thread plug gages produced in carbide—or in steel.

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CIRCLE INFORM-A-GRAM KEY NO. 1141

W. Kenneth Baird is the new manager of manufacturing at the Franklin, Pa., plant of Joy Mfg. Co. He was formerly chief industrial engineer.

◆

Albert H. Clarke succeeds retiring **Carl H. Bissell** as vice president in charge of engineering for Crouse-Hinds Co. **Jay R. Petree** will become chief engineer and **John R. Haney** will succeed Clarke as manager of the Illumination Dept.

◆

New officers of Lasalco, Inc. include **Arthur G. Bignall,** president and **Norman K. House,** vice president. **B. G. Daw** has become a member of the board of directors.

◆

A. D. Schultz has been promoted to chief engineer of the Stamping Div'n of Eaton Mfg. Co. He has been with the company since 1942.

◆

Edwin J. Campbell will supervise process research, Research and Development Dept., Acheson Colloids Co.

◆

Lambert G. Neff, Sr. was elected chairman of the board of Simplex Machine Tool Corp.; **Lawrence J. Radermacher,** president; and **Vernon A. Forsberg,** secretary and treasurer.

◆

The appointment of **Perry C. Smith** as manager of the Equipment Dept. of Brush Electronics Co., has been announced by **C. B. Hoffman,** vice president, sales. He'll direct the department's sales activities which include industrial equipment and computers.

◆

Raymond Meyer will take over as supervisor of manufacturing for ElectroData Corp. He'll have charge of production, purchasing, plant maintenance and production, and materials control.

◆

Robert D. Elbourn will be chief of the Components and Techniques Section of the National Bureau of Standards. A part of the Bureau's recently established Data Processing Div'n, this section investigates new components and devices for electronic computers and techniques for applying them. Mr. Elbourn has been on the Bureau's staff since 1947.

◆

D. M. Hallier has taken over the post of manager of cutting tools for The Motch & Merryweather Machinery Co. Mr. Hallier will direct the operations of both the Cutting Tool Distributor Div'n and The Cutting Tool Manufacturing Div'n. He has been associated with the cutting tool industry since 1925.

MEN YOU SHOULD KNOW

W. H. Allen, who directed plant engineering of Plymouth's new Qualimatic V-8 engine plant, has been promoted to staff plant engineer for the Plymouth Div'n of Chrysler Corp. He'll be responsible for plant engineering at all Plymouth plants.

◆

Carl A. Rasmussen has been appointed assistant chief engineer of the Cadillac Motor Car Div'n. The announcement was made by **C. F. Arnold,** chief engineer. Mr. Rasmussen has been with the company since 1940.

◆

John N. VanEpps has been named vice president of manufacturing by **H. F. Wulf,** president of Madison Mfg. Co. and Madison Industries, Inc. He'll head all manufacturing for both companies, which produce boring tools, deep hole drills, trepanning tools, and adjustable gages.

◆

John D. Knox has joined Sintercast Corp. of America as manager of production. He had been associated with Firth Sterling, Inc., for 15 years. **John B. Adamec** has been appointed chief metallurgical engineer to be responsible for process and quality control in the Production Dept.

◆

Edward O. Edney, Jr., has been named project manager for the nuclear power program of the Steam Div'n of Westinghouse Electric Corp. Formerly a steam application engineer, he joined Westinghouse in 1945.

◆

Robert O. Vaughan has been appointed vice president of National Aircraft Corp. He'll direct the expansion program of the company's Marvelco Electronics Div'n. The division is currently doing advanced development work in specialized electronic fields.

◆

Charles S. Beshore will be director of purchases for Automatic Transportation Co., succeeding **Carle L. Blakeslee** who has retired. He'll be in charge of all purchasing for the company which builds electric-driven industrial trucks.

◆

The post of manager of the newly created Products Div'n of Keystone Engineering Co., will be filled by E. Van Vechten. The announcement was made by **J. A. Baker,** partner and works manager.

◆

Lester W. Graaskamp has been named vice president in charge of the Central Div'n of American Can Co. He spent the first 24 years of his career with Canco in the Chicago and divisional sales organization.

Robert C. Houser has been elected treasurer of H. K. Porter Co., Inc., according to an announcement by **T. M. Evans,** president. He had been with Peat, Marwick, Mitchell & Co.

◆

The New York Air Brake Co. has named **Frederick L. Guyette,** chief plant and equipment engineer. He'll be in charge of plant layout, machine tools, and buildings and equipment for the company's five manufacturing divisions.

H. Charles Yaeger will serve as manager of manufacturing at the Pesco Products Div'n of Borg-Warner Corp. He previously was factory manager for Jacobs Aircraft Engine Co.

◆

G. Lawton Johnson was elected president of Greer Marine Corp., a subsidiary of Greer Hydraulics, Inc. **Edward M. Greer,** president of the subsidiary, was named chairman of the board of the parent company.

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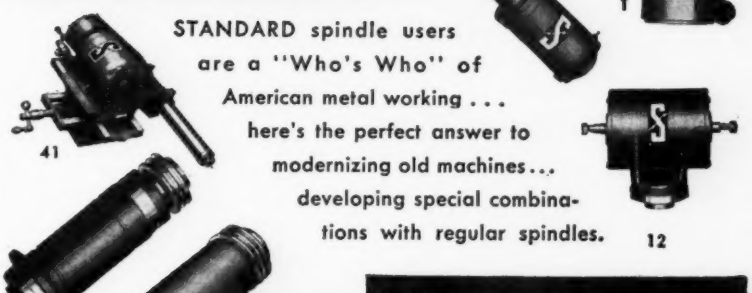
STANDARD spindle users are a "Who's Who" of American metal working . . . here's the perfect answer to modernizing old machines . . . developing special combinations with regular spindles.



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CIRCLE INFORM-A-GRAM KEY NO. 1151

Triangular Shaped Abrasive Stops Tumbling Trouble

Two new barrel finishing media have recently been formulated by the Norton Company. The first, known as Tumblex "T" consists of Alundum vitrified bonded triangular shaped abrasive. This was developed to overcome the problem of the wedging of abrasive in parts being tumbled. The second new media, Tumblex "N" is a natural material. This is being used with good results in finishing, and especially on die castings where conventional abrasives frequently cut through the outside protective layer of the casting exposing the porous structure beneath.

After considerable experimentation with a variety of different shapes, Norton determined that the triangular shape showed the least tendency to wedge. For finishing parts with holes, slots and recesses, many manufacturers have had to resort to hand finishing in the past because picking wedged abrasive from these openings took longer than hand finishing in the first place. The introduction of these new triangular molded shapes of abrasive means that many intricate parts can now be barrel finished with all the benefits of economy and better finish that this method makes possible.

Fig. 1. Parts such as these can be tumbled in Norton Tumblex "T" abrasive without wedging trouble.

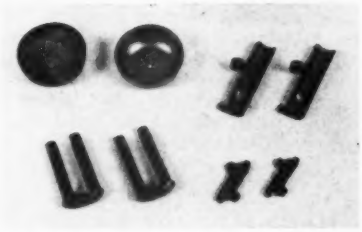


Fig. 2. Before and after samples of work cleaned with Norton tumbling abrasive.

Tumblex "N" is especially suited for use on die-cast items. Conventional tumbling abrasive has just too much cut for this application. Because it cuts slower and has little breakdown, Tumblex "N" does not mar the surface. It also brings up a bright color and luster.

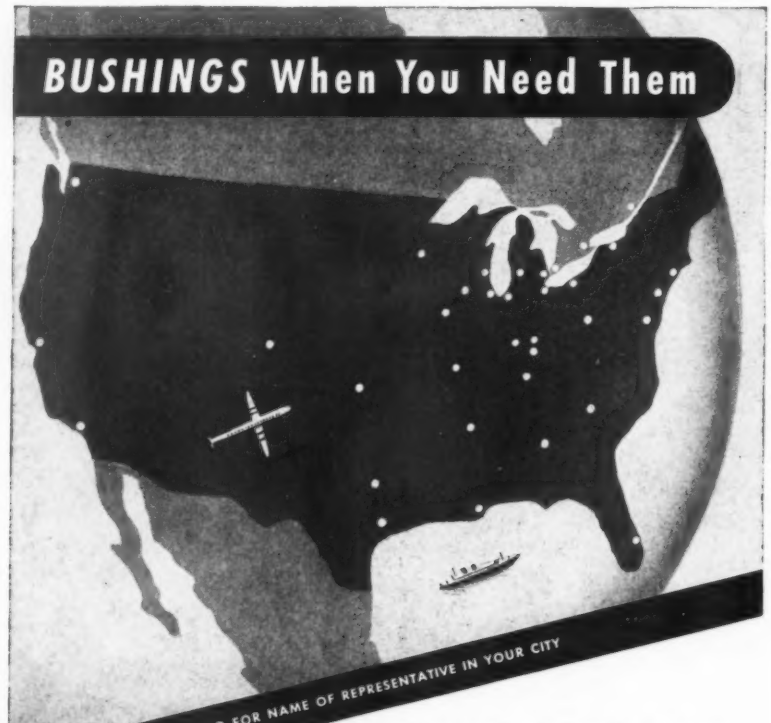
This natural stone also brings up a good color on steel parts as well as zinc, brass, aluminum, and stainless steel.

Tumblex "N" is often used with small amounts of loose abrasive where additional cutting action is required. The loose abrasive can be flushed out of the barrel and Tumblex "N" used alone for finishing.

———•———

Edgerly W. Austin has retired as general manager of the Automotive Div'n of The Timken Roller Bearing Co. in Detroit. He was recognized for a sales career in the automotive industry which saw the revolution in transportation from the Model T to the over 300-hp cars of today. His post will be taken over by Robert G. Wingerter. Mr. Austin will remain with Timken in a consulting capacity at the firm's Detroit office.

———•———



Precision drilling and reaming requires bushings. When you are called upon to build or service a jig or fixture you need bushings right at hand. A shortage at a critical time can cause lost production.

ACME representatives maintain stocks of over twenty thousand ASA and ACME standard size bushings in many strategically located major industrial areas. You need only phone or wire the ACME office nearest you for immediate delivery.

Precision made by highly skilled operators, you will find that these ACME bushings meet your highest requirements. We suggest that you try Acme for finest drill bushings.

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CIRCLE INFORM-A-GRAM KEY NO. 1161

Engineers Find Answer to Tough Tapping Problem

A unique answer to the age-old problem of tapping difficult materials is provided by engineers of Royco Tap and Tool Corp. They point out that it has been quite standard practice in Industry, for some years, to drill and then ream a hole, so that when tapping only 75% of a full thread is tapped.

This practice was quite permissible because a 100% thread is only 5% stronger than a 75% thread, but it requires three times the power to tap. By not tapping a full thread, however, there was room for a burr to turn up on the crest of the tapped thread; and, in many cases, this undesirable condition did result. Also, since only the tips of the threads on the tap are actually cutting, an unstable condition can be created whereby the tap cuts egg shaped out-of-round holes.

Consequently, Royco engineers developed the "Kleen Kut" taps. These eliminate both burrs and unstable tapping conditions by providing a tap cutting edge that cuts both on the root of the tap thread as well as the thread flanks.

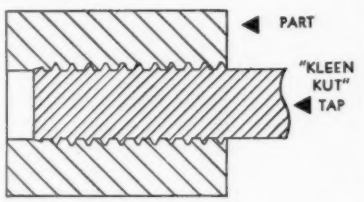
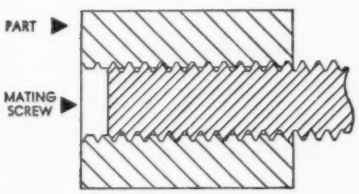


Figure 1 illustrates how the thread of the Kleen Kut tap has full engagement with the part while cutting the thread, thus ensuring stability and concentricity. Figure 2 illustrates how the mating screw has a free burrless fit without interference from burrs normally turned up on the thread crest of the tapped hole.



Made by Royco Tap and Tool Corp., North Branch, Mich., the Kleen Kut taps eliminate the necessity of reaming and, at the same time, require less tapping torque. By actual comparison, tap life from 30% to 50% greater than for conventional taps has been observed.

Presteel Award Goes to A. I. S. I.

The American Iron and Steel Institute received the 1955 Presteel Award for its role in enlarging the field of metal stampings with its continual program of education, research, and materials improvement.

Charles M. Parker, Assistant Vice President of A.I.S.I., accepted the award for the Institute at the Pressed Metal Institute's annual meeting in October. The trophy, in the form of a knight in armor, was presented by Carter C. Higgins, President and General Manager of the Worcester Pressed Steel Co. and Chairman of the Pressed Metal Awards Committee.

The award is sponsored annually by Worcester Pressed Steel, in association with the Pressed Metal Institute.

At the same meeting, P.M.I. officers were named. They are: President Joe J. Boehm, Boehm Pressed Steel Co., Cleveland; 1st Vice President Bruce Krasberg, R. Krasberg & Sons, Chicago; 2nd Vice President Clinton Stryker, Maysteel Mfg. Co., Milwaukee; and Treasurer Bryant Gemmill, American Stamping Co., Cleveland. Harold Daschner is P.M.I.'s Managing Director.

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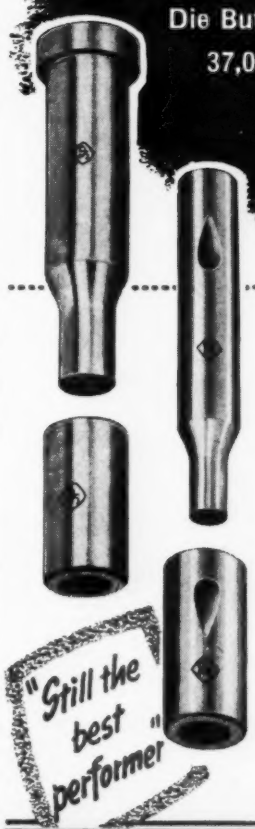

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. . . Feeding Equip. From Page 94

— REFERENCES —

1. LeGrand, R., "Work Loaders Applied to Machine Tools", AMERICAN MACHINIST, 92:-150, March 11, 1948
2. Kraus, C. E., "Hopper Feeds — Basic Types and Their Design", MACHINE DESIGN, 21:119, February 2, 1949.
3. Rylander, A. E., "Elements of Automatic Stock Feeds", TOOL ENGINEER, 29:53, January, 1951.
4. Van Eaton, J., "Mechanical Die Feeds", STEEL MAGAZINE, 130:86-7, March 17, 1952.

— ADDITIONAL READING —

Recent articles published in TOOLING & PRODUCTION on automatic work feed and work transfer:

1. Hill, Walter P., "New Machines and Methods to Improve Output per Man-Hour", p.47, April, 1954.
2. "This Is Transfer . . .", p.56, April, 1954.
3. "Automated Grinding", p.71, April, 1954.
4. "For Standard Machine Tools, Automatic Loading Cuts Costs", p.84, April, 1954.
5. "Automatically Loaded and Unloaded for High Production", p.205, April, 1954.
6. "Increase Production on Your Automatic Screw Machines", p.50, May, 1954.
7. "Grinding Crankpins Automatically", p.68, May, 1954.
8. Meldrum, Charles E., "The Elimination of Safety Hazards in Press Operations", p.52, June, 1954.
9. "Automatic Loaders Speed Output of Broaching Machines", p.80, June, 1954.
10. Bannon, T. W., "Automatic Presses", p.19, July, 1954.
11. Turner, Warren, and Gruber, Paul, "How to Increase Production", p.44, September, 1954.
12. Crane, E.V., "Materials Handling at the Press", p.51, September, 1954.
13. "Magazine Air-Power Loading Arrangement Speeds Production of Long Shafts", p.60, September, 1954.
14. Johnson, W. G., "Progressive Transfer of Skills from Operator to Machine", p.42, October, 1954.
15. "Pneumatic Powered Magazine Bar Feed", p.106, December, 1954.
16. Chase, Herbert, "Fast Process Tooling Speeds Primer Tube Production", p.53, January, 1955.
17. Swanson, Leonard, "Packaged Units Reduce Design and Construction Costs of Automation", p.75, April, 1955.
18. "Automated Piston Grinder", p.196, April, 1955.
19. Sindelar, Frank J., "Automatic Assembly of Ball Bearings", p.75, August, 1955.
20. "Heald to Show Sample Segment of Fully Automated Production Line", p.90, August, 1955.
21. Camp, Richard L., "Fast Milling of Silver Inserts in Plastic Bases", p.132, August, 1955.
22. Heutau, Charles F., "Loaders Automate Standard Production Equipment", p.71, September, 1955.
23. "Automatically Forming 180 Range Bodies per Hour", p.144, September, 1955.

Coming in January:

JACY-MOTION . . . A New Concept in Press Automation

24. "Plymouth Mechanizes Its Final Assembly Line . . ." and numerous other articles relative to the Plymouth Qualimatic V8 Engine Plant, October, 1955.
25. "Automatic Loading Device for Small Part Grinding", p.130, October, 1955.
26. Schug, William W., "Small Firms Compete Successfully by Using Ingenious Automatic Equipment", p.79, November, 1955.
27. "Workpiece Simplification by Stamping" p.81, November, 1955.

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BIN CART BRINGS STOCKROOM TO ASSEMBLY LINE

Martin of Baltimore is using a special cart which literally brings the stockroom to the assembly line. It consists of bins and racks which hold the complete stock of parts for the particular operation it services, and it is moved easily on swivel casters. Thus, instead of many trips to the stockroom, the assemblyman can now reach for the parts at hand as he needs them.

Everyone a Billionaire In the Atomic Age —

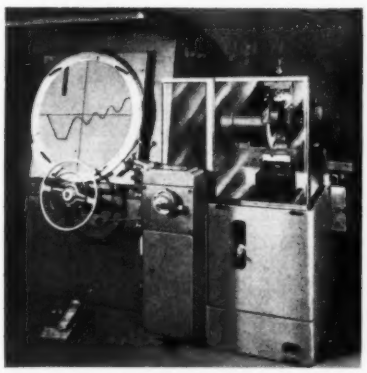
Chemistry teachers used to astound their students by saying that the chemical content of a human body was worth just about 98 cents — a rather humiliating thought. But today, in the atomic age, we're informed that the atoms in the body of an average person contain a potential energy of more than 11 million kilowatt hours per pound, making most of us worth something like $85.5 billion apiece!

Introduces New Optical Contour Grinder

The J & L optical contour grinder will produce profile ground shapes directly from a line drawing. In addition, it duplicates finish ground profiles by automatic tracer control.

This grinder has a hydraulic tracer control coupled with a 30″ screen comparator. The projected image has maximum brilliance and is always in focus.

An outline chart showing the enlarged contour of the workpiece is mounted on the screen. An equally enlarged image representing the cross-section form of the grinding wheel cutting edge, is projected on the screen. As the grinding wheel position is changed in respect to the work table, the projected image moves in the same direction and in a distance proportional to its enlarged size.



This grinder features three quick change precision lens systems, simplified operator controls, and large diameter grinding wheel arranged for coolant. The length and speed of the work table stroke are adjustable.

The optical contour grinder is produced by Jones & Lamson Machine Co., Springfield, Vt.

Films to See

"Die Casting — How Else Would You Make It?" is a 35-minute, 16-mm color and sound film, depicting the scope and versatility of the process. The movie may be borrowed without charge by writing American Zinc Institute, 60 E. 42nd St., New York 17.

Eight 16-mm sound color movies describing the production of steel and important finished products are now available. All of these films may be obtained on a free loan basis from The Colorado Fuel and Iron Corp., New York Advt. Dept., 575 Madison Ave., New York 22.

Styrene Featured in New Plastics Publication

The first issue of Bakelite "Extruderitems" is devoted specifically to Bakelite high-impact styrene. It describes various mechanical properties and offers notes on extrusion and vacuum forming techniques used in making refrigerator parts, displays, signs, toys, housewares, and many other items.

Future issues of the new periodical will give information on contour extrusion and vacuum forming of Bakelite vinyl, polyethylene, and styrene plastics. Write directly to Bakelite Co., Dep't 46, 300 Madison Ave., New York 17, for this and future issues of "Extruderitems."

Harold A. Daschner has been appointed managing director of the Pressed Metal Institute. He has been with the Institute as assistant manager and acting managing director, and replaces Orrin B. Werntz.

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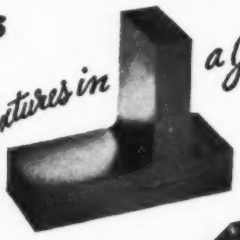

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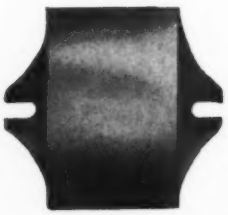
Sure Lock Fixture Keys See Page 41 of our Template Catalog



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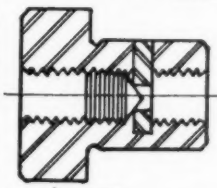

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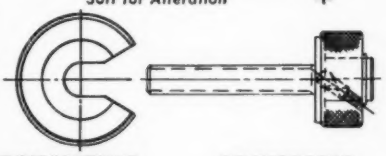

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4	24	44	65	1121	1281	1473	1531	1585	1642	1702	1761	1811
5	25	45	66	1131	1291	1474	1532	1591	1643	1703	1762	1812
6	26	46	67	1141	1301	1475	1541	1592	1644	1704	1763	1813
7	27	47	68	1151	1311	1481	1542	1593	1651	1711	1764	1814
8	28	48	69	1161	1321	1482	1551	1601	1652	1712	1771	1821
9	29	49	70	1171	1331	1491	1552	1602	1653	1713	1772	1822
10	31	50	71	1181	1341	1492	1553	1603	1661	1714	1773	1823
11	32	51	72	1191	1351	1493	1561	1604	1662	1721	1774	1824
12	33	52	74	1201	1361	1501	1562	1611	1671	1722	1781	1831
13	34	53	75	1202	1371	1502	1563	1612	1672	1723	1782	1832
14	35	55	76	1203	1381	1511	1571	1613	1673	1731	1783	1833
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16	37	57	1041	1221	1401	1513	1573	1622	1682	1741	1792	1851
17	38	58	1051	1231	1411	1514	1574	1631	1683	1742	1793	1861
18	39	59	1071	1251	1421	1521	1575	1632	1684	1743	1794	
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A1	A20	A39	B2	B21	B40	B59
A2	A21	A40	B3	B22	B41	C1
A3	A22	A41	B4	B23	B42	C2
A4	A23	A42	B5	B24	B43	C3
A5	A24	A43	B6	B25	B44	C4
A6	A25	A44	B7	B26	B45	C5
A7	A26	A45	B8	B27	B46	C6
A8	A27	A46	B9	B28	B47	C7
A9	A28	A47	B10	B29	B48	C8
A10	A29	A48	B11	B30	B49	C9
A11	A30	A49	B12	B31	B50	D1
A12	A31	A50	B13	B32	B51	D2
A13	A32	A51	B14	B33	B52	
A14	A33	A52	B15	B34	B53	
A15	A34	A53	B16	B35	B54	
A16	A35	A54	B17	B36	B55	
A17	A36	A55	B18	B37	B56	
A18	A37	A56	B19	B38	B57	
A19	A38	B1	B20	B39	B58	

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18	39	59	1071	1251	1421	1521	1575	1632	1684	1743	1794	
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A5	A24	A43	B6	B25	B44	C4
A6	A25	A44	B7	B26	B45	C5
A7	A26	A45	B8	B27	B46	C6
A8	A27	A46	B9	B28	B47	C7
A9	A28	A47	B10	B29	B48	C8
A10	A29	A48	B11	B30	B49	C9
A11	A30	A49	B12	B31	B50	D1
A12	A31	A50	B13	B32	B51	D2
A13	A32	A51	B14	B33	B52	
A14	A33	A52	B15	B34	B53	
A15	A34	A53	B16	B35	B54	
A16	A35	A54	B17	B36	B55	
A17	A36	A55	B18	B37	B56	
A18	A37	A56	B19	B38	B57	
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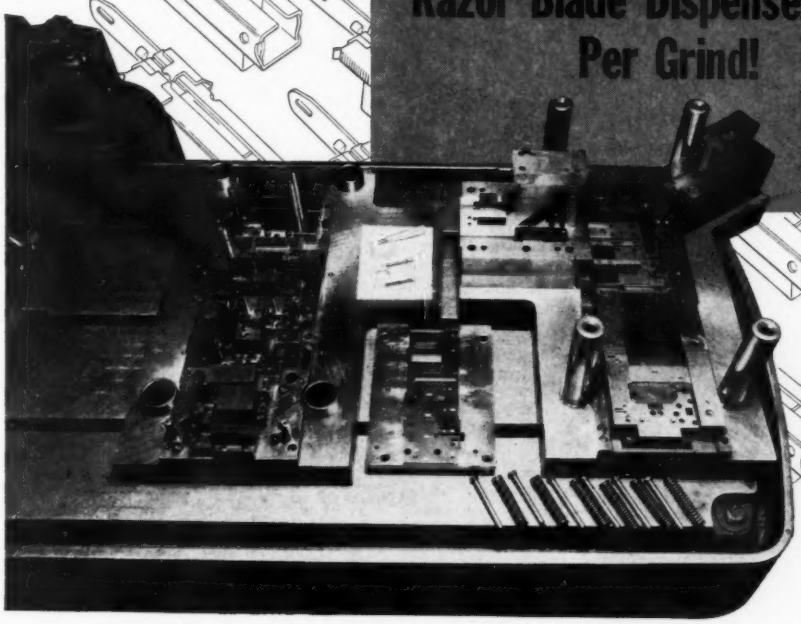

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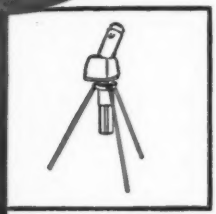

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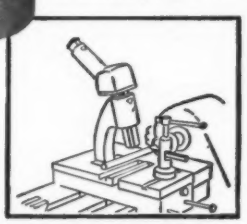

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CIRCLE INFORM-A-GRAM KEY NO. 1221

Beryllium-Copper Tip Outlasts 51,000 Cycles

A beryllium-copper plunger tip on a B&T 450-ton, cold chamber, die-casting machine at Ohio Die Casting Co., still is in good condition after more than 51,000 cycles — enough use to have worn out 10 tips made of a previously used material.

The Columbus, Ohio firm uses the beryllium-copper tip for such jobs as forming locknuts for the plumbing industry from molten aluminum at the rate of 150 to 160 cycles an hour. The 2" dia plunger tip operates in a sleeve to force 20-oz shots of hot aluminum — 1200°F — into a die.

The tip is 4" long by 2" dia and is made of Berylco No. 10, supplied by The Beryllium Corporation, Reading, Pa. The beryllium-copper alloy tip is hot rolled, annealed, turned, and heat treated.

Ohio Die Casting discovered that the use of the beryllium-copper tip not only permitted highly desirable closer fits — .0005" clearance for the Berylco tip against .001" clearance for other alloys — but that the result of cutting the clearance in half actually doubled the life of the beryllium-copper tip.

The firm uses a water cooling system to keep the tip cool and tight in the sleeve. When a beryllium-copper tip is first placed in use, the water cooling rate is increased as much as possible. As the tip starts to wear, the cooling rate is reduced so that the heat expands the tip to fit more tightly in the sleeve.

By controlling the cooling system in this way, Ohio Die Casting is able to maintain the initial close fit for the life of the plunger tip. It is significant that, even with the closer tolerances and the longer use of beryllium-copper tips, the firm has

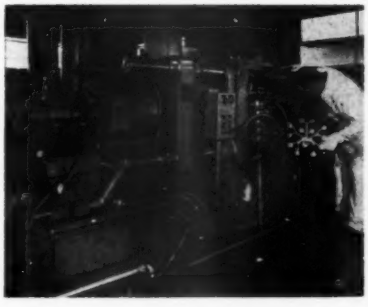

Fig. 1. The Ohio Die Casting Company uses this 450-ton, cold-chamber, die-casting machine to produce a wide variety of aluminum parts. The operator is holding a group of aluminum lock nut blanks from a 12-cavity mold. A beryllium-copper plunger tip has made over 51,000 shots producing these lock nut blanks without failure or serious wear.

never had a tip stick. All other types of tips have stuck in the sleeve at one time or another despite the fact that they were given twice the clearance of beryllium-copper tips.

As a test, the plunger tip that is still in use was once run for an eight-hour shift without any water cooling at all. Under this severe condition the plunger tip worked satisfactorily, did not stick, and showed no evidence of serious wear.

The advantages of beryllium-copper for use in such critical components as plunger tips stem from the unique combination of physical properties characteristic of the alloy. Beryllium-copper is the only alloy that combines excellent thermal conductivity with tensile strength, endurance, and wear resistance comparable to that of steel.

Fig. 2. Molten aluminum at 1200° is poured into the orifice of the sleeve, for a shot of locknuts. The 2" plunger with its beryllium-copper tip forces the metal into the mold. Note the close fit of the tip into the sleeve. The clearance is .0005". This tip, which has made over 51,000 shots, shows only slight scoring and feathering as evidence of wear.

As the tip moves in to feed the aluminum to the die, the impact tends to peen the edges of the tip outward against the sleeve. This is a desirable effect, since it tends to preserve the close tolerances.

As the tip wears, it feathers at the inlet end around the plug. When this feathering becomes excessive, the tip is removed, the edges are pounded out with a hammer and the tip is returned so it will again fit the sleeve.

The Inform-A-Gram Card page 120.1 is for your convenience in making inquiries about advertised products and editorial subjects.

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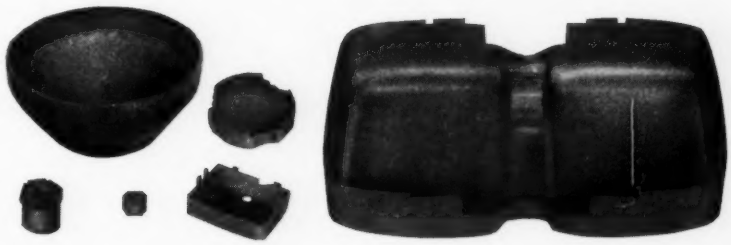

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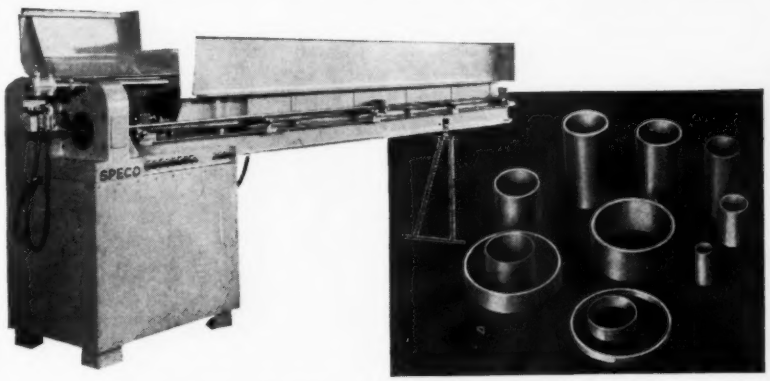

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CIRCLE INFORM-A-GRAM KEY NO. 1231

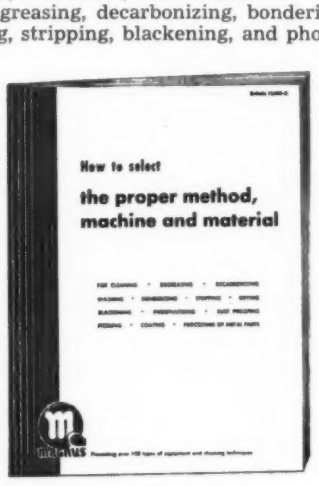
Additional Spring Design Data Sheets have been published by Hunter Spring. Basic considerations in the design of precision springs are discussed. Subjects covered include spring index, coil diameter variation, modulus and physical properties of spring materials, and tolerances. Also presented is a comparison of cost and physical characteristics of spring materials. To get these data sheets illustrated with line drawings, graphs, and charts, contact Hunter Spring Co., Engineering Dept., Lansdale, Pa., or — **Circle Inform-A-Gram No. C1.**

The Applications and Procedures for using "Scotchply" reinforced plastic are described in a 20-page reference manual. Possible uses for the product in various industrial fields are shown in 62 illustrations. Among the procedures explained are machining, sanding and grinding, sawing, milling, shaping, turning, drilling, and tapping. "Scotchply" is a formable glass-reinforced plastic sheeting for use in mass production. Detailed charts in the manual describe the material's mechanical, electrical, chemical resistance, and thermal properties. Detailed instructions are also given for molding and handling the reinforced plastic. For copies of this reference manual, write to Minnesota Mining and Mfg. Co., Dept. SP5-295, 900 Fauquier Ave., St. Paul 6, Minn., or — **Circle Inform-A-Gram No. C2.**

"Fringe Area Lubrication with Molykote Lubricants" presents the variety of "Molykote" lubricants now available. Seventeen types of the molybdenum disulfide lubricant line are listed. A highlight of the bulletin is a selector chart which describes each "Molykote" type, the kind of carrier used in it, the temperature range in which it operates best, and the proper method of application. Featured is a complete explanation, with diagrams, of the importance of this compound in extreme bearing pressure, and high, low, and normal temperature lubrication applications. Bulletin 103A may be obtained from The Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn., or — **Circle C3.**

"Facts You Should Know When Buying and Using Diamond". The strength features of diamond and the characteristics of good diamond powder are discussed. Two-color graphs show MOH system of hardness, comparison of hardness by indentation tests, and a comparison of cutting speeds of abrasives. Illustrated Booklet No. 1 Diamond Series is published by Abrasives Div'n, Elgin Natl. Watch Co., Elgin, Ill., or — **Inform-A-Gram No. C4.**

"How to Select the Proper Method, Machine, and Material" presents over 100 types of equipment and cleaning techniques. Illustrated and described in the manual are methods, materials, and machines for degreasing, decarbonizing, bonderizing, stripping, blackening, and phosphating. Also covered are rust proofing, pickling, coating, and processing of metal parts. Copies of Bulletin 10,000-G are issued by Dept. T & P, Magnus Chemical Co., Inc., Equipment Div'n, Garwood, N. J., or — **Circle Inform-A-Gram No. C5.**



"Strain Gages" is a comprehensive discussion of the relationship between stress and strain. Taken into account are the type of strain, type of member, and environmental considerations. The text is supplemented with formulas and mathematical computations. Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena, Calif., will supply copies of the pamphlet, Form CEC-1563, or — **Inform-A-Gram No. C6.**

The Design and Application of threaded fasteners are covered in a National Machine Products engineering data section. Fastener design, the factors in wrench torque, gaging, and the fishtailing nut are among the subjects discussed. Various diagrams and charts aid in the explanations. Tables and charts present wrench torques, mean root area and mean equivalent areas of thread sections, a comparison of unified American Standard series, and internal and external thread tolerances. One section is devoted to distinguishing between unified and American screw thread classes. National Machine Products Co., Utica, Mich., will provide copies of this Engineering Data Section, or — **Circle Inform-A-Gram No. C7.**

"Handbook of Hydraulic Tables and Other Engineering Data" is a comprehensive reference work for hydraulic engineers interested in pumping and piping problems. Included are hydraulic information and tables, electrical and steel pipe data, and a discussion of air bottle accumulators, complete with tables. Other tables cover saturated and super-heated steam, materials for pumping various liquids in lbs/gal. at various temperatures. Also in the handbook are a viscosity conversion chart, a graph showing total volume of tank accumulator in gallons and diagrams of discharge flow. Copies of Bulletin 50 may be obtained by writing to The Aldrich Pump Co., 25 Pine St., Allentown, Pa., or — **Circle Inform-A-Gram No. C8.**

"How to Select Wheels for Precision Grinding Tool and Constructional Steels" is the title of a new Norton booklet. It presents a discussion of a new method of selecting grinding wheels for tool steels. Tables give the classification and nominal composition of principal types of tool steels and experimental grindability values. Grinding wheel recommendations are also included. In addition, precision grinding of constructional steels is covered. Copies of this illustrated booklet may be obtained from Norton Co., Worcester 6, Mass., or — **Circle Inform-A-Gram No. C9.**

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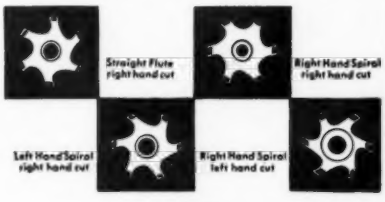

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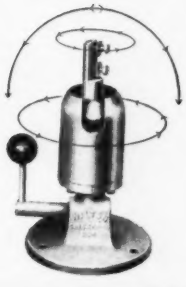

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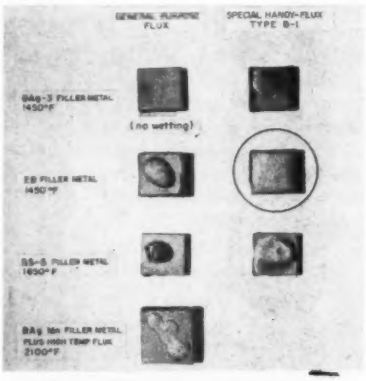
CIRCLE INFORM-A-GRAM KEY NO. 1261

Cemented Chromium Carbide Brazed with New Flux

A practical production method has recently been developed for brazing cemented chromium carbide with silver alloy filler metals. This development was carried out at the Carboloy Department of General Electric Company in cooperation with Handy & Harman, manufacturer of silver alloy filler metals and fluxes for brazing.

The new technique is expected to pave the way for wider use of cemented chromium carbide for applications in the 600°F range, where the alloy could not be used heretofore for lack of a suitable joining method. Such uses include chemical and food equipment, valve components, extrusion nozzles, gage blocks, high speed instrument bearings, and similar applications where good resistance to corrosion, abrasion and oxidation — particularly at elevated temperatures — is essential.

In the past, cemented chromium carbides have been successfully brazed in an atmosphere of pure, dry hydrogen or by using filler metals of high silver and manganese content. However, such methods have not been adaptable to economical production. The new process, worked out with Carboloy grade 608 cemented chromium carbide, now makes it possible to braze these alloys in air without special equipment, using one of several commercially-available silver alloy filler metals.



Test specimens comparing the wetting ability of various combinations of brazing fluxes and silver alloy filler metals on Carboloy grade 608 cemented chromium carbide. The best combination is Special Handy-Flux Type B-1 and Type EB brazing filler metal. For comparative purposes a specimen using silver manganese filler metal and a high temperature flux is shown at lower left.

The technique is based on the use of a brazing flux containing powdered boron. It was initially developed in connection with the Carboloy project by Handy & Harman and now available as a standard product called Special Handy-Flux Type B-1. Boron, being a strong reducing agent, appears to have outstanding ability to dissolve the characteristically tough chromium oxide film encountered in chromium carbide and the flux was found to promote good wetting and bonding between grade 608 cemented chromium carbide and several of the silver alloy filler metals tested. The best results were obtained with a combination of the boron-containing flux and Type EB silver alloy filler metal (57% Ag, 33% Cu, 7% Sn, 3% Mn).

The procedure developed for brazing grade 608 cemented chromium carbide is as follows:

1. Sandblast the chromium carbide and steel surfaces to be joined.
2. Clean these surfaces with a suitable solvent. Flux the pieces with Type B-1 flux.
3. Assemble the pieces in a jig or work holder, preplacing the brazing filler metal in the joint.

Apply additional flux to restore the continuous coating if necessary. In addition to type EB, types SS-5 and Easy-Flo No. 3 alloys may be used).

NOTE: In some cases when brazing chromium carbide to steel, it may be necessary to "tin" the surface of the chrome carbide with the filler metal as a preliminary step. If so, the carbide should be heated carefully on the surface opposite to the tinning surface, using a reducing flame. The metal should be heated to a temperature just exceeding the flow point of the filler metal as rapidly as possible, but care must be taken to prevent localized overheating.

4. Heat the joint to about 1450°F, or 100° above the flow point of the filler metal, whichever is higher. This superheating is necessary to assure good wetting of chromium carbide. With torch heating, a slightly reducing flame must be used. Apply the flame to the steel part of the assembly. If necessary to apply the flame directly to the chromium carbide, take care to prevent overheating the flux.

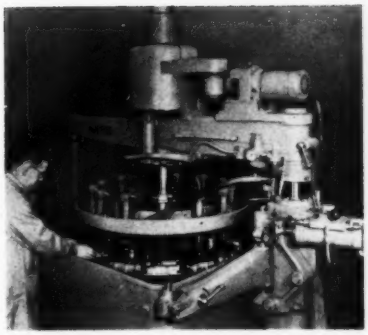
5. The chromium carbide should, if possible, be "puddled", or moved around slightly, when brazing temperature is reached to help eliminate entrapped pockets of gases or flux. The assembly should, of course, be correctly aligned before the heat is removed.

New Machine Flat Laps Single or Parallel Faces

A recently designed lapping machine features the provision for either single or parallel face flat lapping with arrangements for a plain, time cycle; automatic continuous feed; or semi-automatic continuous feed.

This No. 48F Hyprolap high production lapping machine, developed by the Norton Company of Worcester, Mass., provides the means of handling a greater range in workpiece size at a more productive rate and with far less operator attention than were previously available. These features also provide a better means of sizing control.

For single face lapping the machine mounts a single 48" diameter bonded abrasive wheel lap on a rigidly supported, heavy duty, vertical spindle. Workpieces are retained



in suitable adapters and proper lapping pressure secured through weights or pressure devices as required. Truth of the lap face is generated and maintained by a rugged, column mounted diamond truing arm, operated hydraulically.

Opposed parallel flat faces can be lapped in this machine simultaneously. For this operation a massive column and over-arm arrangement is provided to support the upper 48" diameter lap. Workpieces are held in retainers between the two laps and sizing is controlled by raising the lower lap with the Norton "click-

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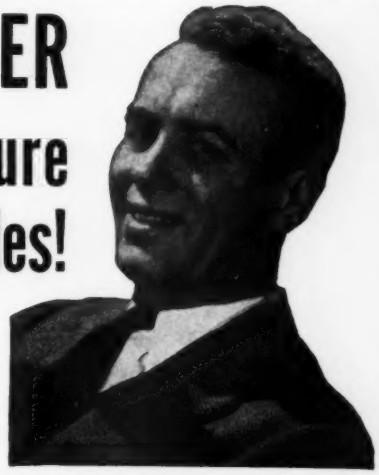

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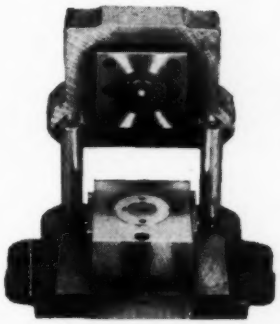

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The plain, timed cycle arrangement uses an electric timer to control the machine cycle. The operator merely removes finished parts, inserts rough parts and then presses a push button to start the cycle which is terminated automatically by the timer. With the semi-automatic continuous feed arrangement, the operator removes finished work and replaces them with new parts as the lapping is done continuously in a single pass through the laps. The automatic continuous feed arrangement eliminates the loading and unloading functions of the operator and places them in automatic handling equipment.

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Color Television Deflecting Yoke Segment Grinding

Like all progressive American manufacturers, Radio Corporation of America continually strives to price its products to attract the American mass market and, like all manufacturers, its prices depend on the efficiency of its manufacturing methods.

Special machine tools are the means that RCA frequently uses to achieve such efficiency. One of the current projects is special deflecting yokes for use in RCA color receivers. Here again a special machine tool provided the answer to a manufacturing problem.

The deflecting yoke is made up of 4 coils with a core molded in 4 segments to provide the desired electrical characteristics. These segments are molded from a special ferrite mix process similar to the powdered metal process. After molding, sintering takes place. The parts are fired at high temperatures and become hard enough to cut glass.

To get maximum efficiency from these cores, it is necessary to form the eight mating surfaces between the 4 segments very accurately to produce an exact cylinder. Extremely accurate grinding, therefore, is required on both ends of each segment to produce a smooth surface and true 90° mating ends. RCA has been accomplishing this operation on yokes for its black-and-white receivers using special machinery heretofore engineered and constructed in its own plant. The color core presented a problem in physical size and, because RCA's own Equipment Development Section was overloaded, The DoALL Company, was called in. This company in conjunction with RCA agreed on a machine design to handle the yoke segments and proceeded to build the machine (Fig. 1).

Fig. 1. Side view of the special grinder for deflecting yoke segments showing the twin spindle, three station design.

Here's what it does:

1. Automatically loads the part, aligns it, grinds it, and discharges it.
2. Grinds both ends of the segment simultaneously.
3. Automatically takes the segment down to the desired dimension, finish, and flatness in three fast, successive grinds. (Finish 16 micro-inches rms; flatness within 20 millionths across entire surface, Fig. 2).
4. Maintains the planes of the ground ends at 90° to each other within 50 micro-inches over the ⅞" end width and does this while producing the pieces at a rate of one piece every three seconds (Fig. 2).

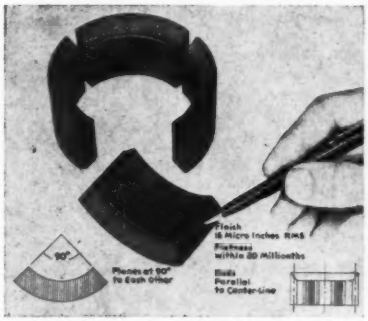


Fig. 2. The segment must be ground within the tolerances shown in the illustration. This is done even while producing pieces at the fantastic rate of 1 every 3 seconds.

Segments, molded of powdered ferrite, are stacked in a vertical magazine, ends facing out from the machine (Fig. 3). A hydraulic loader at the base of the magazine pushes the bottommost segment into a fixture, one of 36 mounted on the periphery of a large motorized index

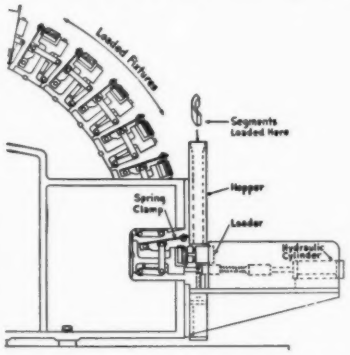
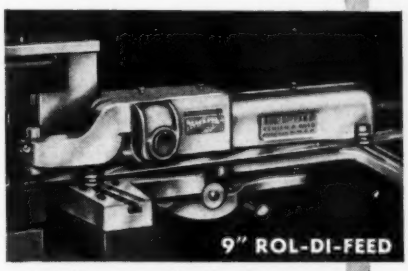


Fig. 3. Detail of the loading arrangement on the segment grinder. The loader pushes the bottom-most segment in the magazine hopper into an empty fixture on the index wheel. At the same time the loader piston actuates the fixture so that it clamps the part securely in place. Another hydraulic piston (not shown) holds up the column of segments in the hopper to prevent interference with the loading action.

Fig. 4. Demonstrating the movement of the paired grinding heads with respect to the loaded segment on the index wheel. Note movement of grinding wheel across surface of segment. Hydraulic cylinders move the heads on the grind and return strokes.

wheel (48" dia). Upon seating the segment, the loader also pushes a lever that causes the fixture to clamp the segment securely in place.

When a part has been loaded, the wheel indexes 10°, moving the loaded fixture toward the first pair of grinding spindles and the next empty fixture up to the loader. The workpieces are carried through three grinding stations. At each station, the index wheel stops and is accurately positioned by a hydraulic actuated locking pin. After the index wheel is securely locked, twin grinding spindles, moving hydraulically on hand-scraped ways, carry



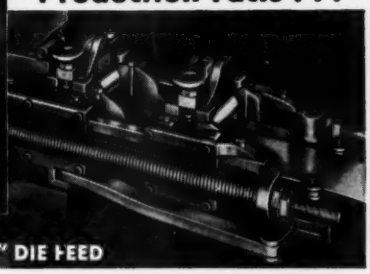
* 24 hours per day for 3 years — production over 70 million pieces.

TOP PRODUCTION every minute . . . of every day!

NO HAND FEEDING FATIGUE . . .
NO AFTER LUNCH LET DOWN . . .
with Dickerman automatic punch press feeds!

* Feeds .020" cold rolled steel at 336 strokes per minute — over 160,000 pieces per 8 hour day.

These Are Actual Production Facts . . .



* 3 feeds produced over 100 million pieces in less than a year.

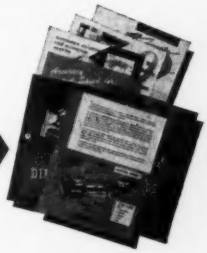
Dickerman

H. E. DICKERMAN MFG. CO.

324-256 ALBANY ST. • SPRINGFIELD, MASS.

*Actual users names furnished on request.

12 standard feeds can be shipped from stock to solve your immediate problems. Send for literature today!



CIRCLE INFORM-A-GRAM KEY NO. 1291

diamond, cup grinding wheels across the segment faces (Figure 4). At the first station, all but .035" is removed; at the second, .025" more; and, at the third station, the final .010" of stock is removed to bring the piece to size and to generate an extremely smooth surface flat and square to 20 millionths.

After completing their pass, the grinding spindles withdraw to starting position, the index wheel rotates through 10°, the loader seats another segment in an empty fixture while the spindles advance again on a grinding pass toward the adjacent fixture. The workpiece is carried past the final position where an automatic ejector drops it to a conveyor which carries it away from the machine.

Basic Design Considerations

The DoALL Company has incorporated into the three-station segment grinder the same construction principles and many of the same components that are found in their standard grinders. To generate micro-finishes and maintain tight dimensional control, it was necessary to provide balanced, reinforced mass in the grinder's structure to achieve dampening, rigidity and stability. The index or work holding wheel is carried upon a 5" dia steel shaft and tapered roller bearings.

The electro-hydraulic design which effects automatic downfeed accurate to .0002" in the standard grinder, is used to index the work holding wheel in the segment grinder. The hydraulic index stroke is cushioned to provide rapid but shock-free deceleration of the heavy index wheel.

Spindles

The motorized cartridge type spindles are standard types used in the company's 6" x 24" and 8½" x 24" surface grinders. An integral 1½ hp drive motor and tapered roller bearings give them considerably more power and load capacity than ordinary spindles of the same size and type.

Work Holding Fixture

In designing the 36 work holding fixtures, several severe limitations were dealt with. The workpiece is extremely hard, brittle, and rough. The pieces vary considerably due to distortion that takes place during the sintering operation. Since the actual grinding is performed by diamond wheels, the fixtures must withstand a bath of grit-laden coolant. With only 10° of arc on a 48" diameter for mounting space, the fixture must, nevertheless, be strong enough to support the workpieces under grinding loads. Their location on the periphery of a revolving wheel and the flood of grit-laden coolant makes either hydraulic or electrical actuation impractical.

The ultimate solution was a compact lever-actuated spring clamp shown in Figure 3. Locating pads in the fixture are made of hardened tool steel and are designed for easy removal and replacement making for inexpensive maintenance. Sufficient adjustment has been provided for, to permit compensation for possible variation between runs of the sintered parts. The part is held in place by a leaf spring to which are attached hardened fingers which contact the tapered lip of the segment. A simple link arm and wedge system, actuated by the hydraulic loader, locks the spring mounted fingers against the piece. A second arm is actuated by the hydraulic discharge mechanism to push the locking wedge back, permitting the fingers to release their hold and drop the finished part upon a conveyor running through the hydraulic tank at the bottom of the machine. The mechanical principles used are such that considerable wear can take place on all but the locating surfaces of the fixture without impairing its accuracy and efficiency.

Index Wheel

The index wheel and associated mechanism are of straightforward design, but the tolerances held and the refinements of indexing and locking assemblies deserve comment. Fixture mounting pads are machined to an accuracy of +.0015", −.000

Cut Costs with Bokum Boring Tools

Cost-minded tool engineers who have boring operations under their wings have but one idea in mind—stepping up the number of precision-bored holes before tool resharpening is necessary.

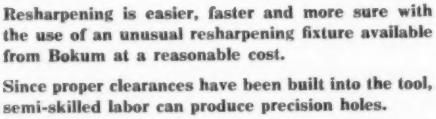
Here's why they come to Bokum:

1. **Bokum boring tools retain their combined radial and helical relief based upon a mathematical formula throughout the life of the tool. This means factory-new tools after each resharpening and extra-long tool life.**
2. **Resharpening is easier, faster and more sure with the use of an unusual resharpening fixture available from Bokum at a reasonable cost.**
3. **Since proper clearances have been built into the tool, semi-skilled labor can produce precision holes.**
4. **Tools for holes 1 1/16" diameter and up are available in two-piece construction: cutter and bar. Only the head must be replaced.**

STYLE A
for general boring

STYLE B
for bottoming and facing

STYLE C
for internal threading



Combined helical (a) and radial (b) backed-off cutting form permits resharpening on only one face (c)

Write today for the catalog concerning the tool you need:

Cat. 1139-6 High speed steel boring tools
Cat. 398-6 Carbide-tipped boring tools
Cat. HSS-500 Short neck high speed steel boring tools
Cat. CT-500 Short neck carbide-tipped boring tools
Cat. T-R Thread recessing tools
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CIRCLE INFORM-A-GRAM KEY NO. 1301

across the diameter. The 36 hardened steel bushings that provide a seat and the important locking locating pin are located with less than .002" variation between centers.

As an indexing movement ceases, the locking locating pin moves under hydraulic action to engage the adjacent bushing in the index wheel. At the same time, another cylinder applies pressure against the opposite side of the wheel to support the wheel and thereby prevent any deflection that might be caused by the pressure of the locking pin against the wheel. The short taper of the pin and bushing makes these members self-centering.

All these design elements contribute to the difficult task of maintaining a high standard of accuracy in dimension and finish . . . even while meeting large production requirements.

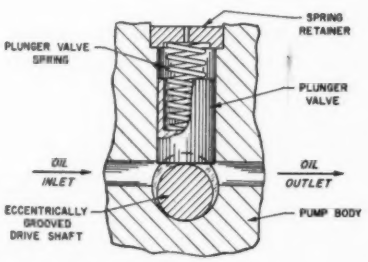
New Lubricator Holds Accuracy of Precision Machines

A new automatic lubricator designed to solve the problems of lubricating high precision machines, which through the use of a constant-pressure rotary pump, maintains a continuous oil film of constant thickness on critical bearing surfaces. This unit, developed by Bijur Lubricating Corp., Rochelle Park, N. J., eliminates two major problems: the rise and fall of tableways and other precision bearings due to periodic hand oiling or cyclic lubrication; and the constant dripping of oil that occurs with high volume flood lubrication systems.

Variations in surface separation caused by hand oiling often make it impossible to attain the degree of accuracy required by the work on precision grinders, optical, and testing machinery. Bijur's new lubricator maintains a boundary film of oil at a constant pressure, thus eliminating objectionable film variation and excess oil drip.

A pressure of 20 psi is maintained by the lubricator throughout the distribution system and at the lubrication points. The compact system is designed for use on equipment which must work to very close tolerances, and all elements can be fitted neatly into such machines without interfering with their operation in any way.

The 5/16" dia pump shaft contains an eccentric groove, .05" at its deepest point, in which a spring loaded plunger valve rides. This plunger valve serves both as a seal between the inlet and outlet ports and as a relief or unloading valve to maintain the constant 20 psi. As the shaft rotates, oil is drawn in through the filter to the "sweep area" of the eccentric groove, carried around to the opposite side, and then discharged into the outlet line.



Cross sectional drawing of pressure mechanism inside lubricator. Plunger valve above shaft maintains constant pressure on shaft by spring mechanism. Oil passes shaft into distribution system only when groove is in down position.

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More and more of industry's automation problems today—solved with T-J Spacemaker Cylinders! New compact design and many more plus features for a new high in efficient cylinder performance and dependability. Wide range of styles, capacities . . . to help you *save labor, reduce costs* on all kinds of push-pull-lift jobs. Send for bulletin SM-155-1. The Tomkins-Johnson Co., Jackson, Mich.

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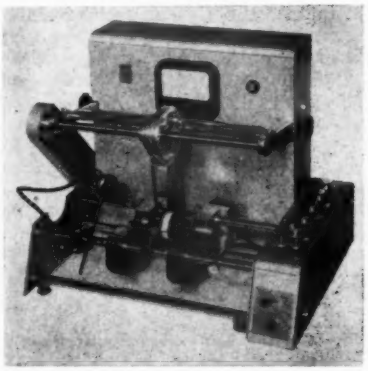
CIRCLE INFORM-A-GRAM KEY NO. 1311

New Electronic Machine Locates and Measures Rotational Unbalance

High rotational speeds common to modern machinery have led to the requirement for a much greater degree of accuracy in the balancing of rotating components. Both industrial and consumer products using high rotation, non-planar components (rotors, blades, armatures, fan units, etc.) require highly accurate balance to achieve smooth operation. Since the centrifugal force of an out-of-balance mass increases as the square of the rotational speed, many high speed components can be inefficient or even destructive if not dynamically balanced. Such dynamic balance cannot be achieved quickly, accurately or economically by mechanical methods . . . but this problem has been overcome by the introduction of electronic balancing methods.

Pictured here is a new high precision electronic balancing machine which enables smaller cylindrical bodies to be dynamically balanced. The machine measures unbalance in two planes of correction and locates the unbalance angularly by means of a stroboscopic lamp. Identified as Type 1250, this machine measures out-of-balance masses as low as .0013% of total weight which is now the generally accepted standard for high rotational balance. Location and correction determination usually made within 30 seconds makes this machine ideal for precision production line demands.



The part or assembly to be balanced is supported on two cradles and rotated by the machine up to 2,700 rpm. Vibrations due to unbalanced masses are picked up by rods in the cradle to generate an alternating voltage proportional to the amplitude of the vibration of the work. This current, fed to a meter, is amplified so that even minute vibrations give a reliable reading on the meter. The vibrations also actuate a stroboscopic lamp which angularly locates the unbalance.

A filter network is included in the apparatus which is set to pass only those vibrations of the work which occur once per revolution. Control switches select either right or left hand plane for correction and readings of each plane are completely independent of the amount of unbalance in the other.

Parts or assemblies up to 13" long, 5" wide and 10 lbs in weight can be handled. All controls are pre-set except those necessary for operators' use and an unskilled operator can use the instrument after brief instruction.

Portomag Sales, Inc. has been formed to handle both national and foreign sales and service of Portomag units. These new portable magnetic drill presses are manufactured by Lupear's Tool and Die Co. Headquarters for the new organization has been established at 1511 E. Nine Mile Rd., Ferndale 20, Mich.

Fully automatic BURR-MASTERS
for deburring internal & external gears and splines
ABOVE: MODEL BMI-15 FOR INTERNAL GEARS
BELOW: MODEL BME-24 FOR EXTERNAL GEARS
• Entire tooth form including root deburred and chamfered at 5 teeth per second—automatic load, deburr and unload
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CIRCLE INFORM-A-GRAM KEY NO. 1321

Receive Medals

John M. Tyler of Pratt and Whitney Aircraft Div'n, and Edward C. Perry, Jr., United Aircraft Corp., were awarded the Society of Automotive Engineers Manly Memorial Medal. This Award goes to the author of the best paper on aeronautic powerplants. Tyler and Perry's paper was entitled "Jet Noise".

Jacques Yves Pierre Sejournet was one of the 1955 recipients of The Franklin Institute's John Price Wetherill Medal. He was recognized for his invention of the Ugine-Sejournet Extrusion Process for metals, using glass as a lubricant.

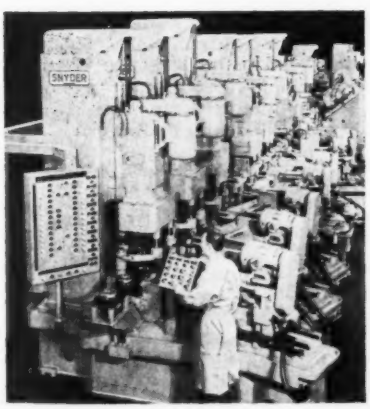
For his invention, the "timing belt", Richard Y. Case, assistant manager and chief engineer, Power Transmission Dept., United States Rubber Co., was awarded the Edward Longstreth Medal of the Franklin Institute. The rubber and fabric belt with teeth doesn't depend upon frictional grip for the transmission of power and makes possible precision timing between two or more shafts. It's known commercially as the U. S. Powergrip and Gilmer Timing Belt.

The annual Doehler Award was presented to Charles Pack, former vice president of the Doehler-Jarvis Div'n, National Lead Co. He was cited for 44 years of pioneering effort in the die casting industry.

Greater Flexibility Provided by New Segmented Concept

A new concept of segmented automation is revealed in a 111' multi-station, in-line Snyder transfer machine for producing automatic transmission front oil pump bodies.

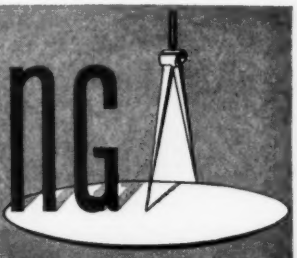
Machining operations are performed by 23 individual machines or segments, each having individual base and slide units and individual control panel. The only connection between the segments is a single transfer bar that moves parts in process from one machine segment to the next. The transfer bar is made up in sections.



With this arrangement, it is relatively simple to add or remove segments as dictated by part design changes. All that is required is to disconnect the transfer bar; lengthen the machine by moving the other segments; insert the new machine bases, control panels, and transfer bar sections; and make necessary alterations in the master control panel that integrates the function of individual panels on the various machine segments.

A very important advantage gained at the outset of a tooling program is the ability of the machine tool builder to proceed with design and construction of various segments before the design of the part to be processed has been fully finalized. Thus the new concept introduced by Snyder Tool & Engineering Co., 3400 E. Lafayette Avenue, Detroit, can measurably reduce machine tool delivery time.

to economize
STANDARDIZE *with* RING



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Special Machine Built up From Standard Units

One of the most important trends currently gaining momentum in the special machine tool industry is exemplified in the latest machine delivered by Michigan Drill Head.

Built for a farm implement manufacturer to produce pump bodies, this highly special machine is constructed largely of Michigan standard components. These include vertical way-type hydraulic feed units, self-contained master lead screw tapping units, and the huge 60", 11-sta. automatic index table.

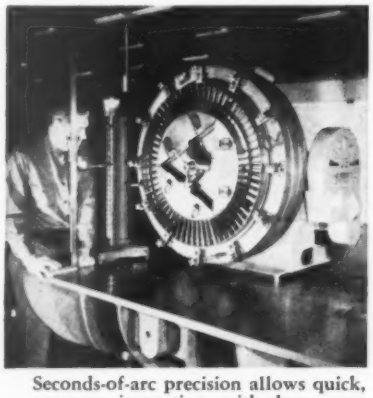
To permit using both horizontal and vertical spindles, a 2-position power-operated fixture is employed. Fixture units have interchangeable details. All vertical, multiple-spindle heads are provided with additional quick-change spindles to reduce downtime for tool changes. All horizontal units are provided with angular adjustments.

The diversified operations performed on this special machine developed by Michigan Drill Head Co., 971 E. 8 Mile Rd., Detroit, include drilling, chamfering, reaming, end milling, trepanning, rough boring, finish boring, and tapping.

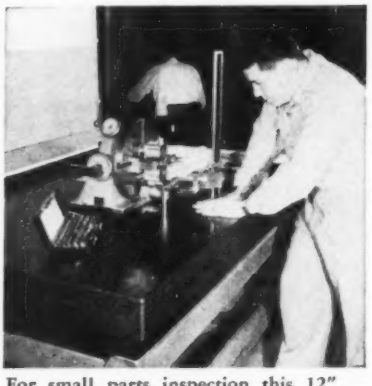
ROTABS Beat Precision Inspection Costs...

This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.

Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.



For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

For complete data on the optical precision readings you get with the ROTAB at the lowest cost, write:

MACHINE PRODUCTS CORP.

6771 East McNichols Road . Dept. G . Detroit 12, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1341

At Your SERVICE

The new nickel-plating method, available as a contract service by The Reliable Spring & Wire Forms Co., Cleveland, coats even concealed surfaces on springs, wire forms, electronic coils, and filament parts. Cost-wise, the greatest savings, reports Reliable, will occur when plating parts which previously, because of tangling or bad proportions, had to be plated by the still tank method rather than in barrels.

An electronic data processing service has been added to the systems and procedures department of Anderson-Nichols Co., consulting engineers in Boston.

Superwelding, an improved high-temperature, high-production copper brazing process developed and now offered as a contract service by Superweld Corp., N. Hollywood, Calif., permanently bonds together ferrous metal parts in a controlled-non-oxidizing atmosphere. The process allows use of low-cost steels, eliminates or reduces machining operations, and facilitates fabrication of complex assemblies from simple parts. Parts may be heat treated after Superwelding.

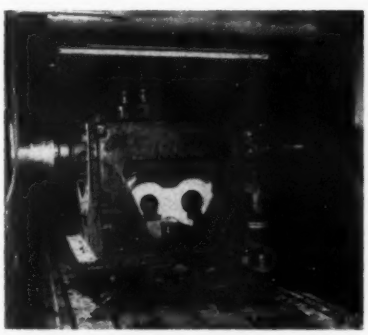
An intensified press forging development program at Harvey Aluminum, Torrance, Calif., is aimed at providing manufacturers with technical assistance in formulating new commercial uses for aluminum forgings. Installation and use of heavy hydraulic presses has made this service possible.

Milling Time Cut Drastically by Switch to Carbides

A 79% reduction in profile milling time on sandy cast steel pump brackets was recently realized at the DeLaval Steam Turbine Company, Trenton, N. J., by using standard face Kennamills which permitted increased speeds and feeds and produced a higher micro-inch finish.

The rough and finish milling time —on an Ingersoll planer type 75-hp mill—for both ends and joint face on the pump brackets dropped from four hours to 65 minutes when the switch was made from high-speed steel cutters.

Prior to the use of Kennamills, the DeLaval company used three 12" dia high-speed steel cutters under the following conditions: Roughing —5 ipm feed, 75 sfm and ¼" to ⅜" depth of cut; finishing—6 ipm, 110 sfm and 0.010" depth of cut. A second set of cutters, with a modified grind, was required to remove feed marks. Cutter life was 1 pc/grind on roughing and 2 pcs/grind on finishing.



Using 12" "Universal" face Kennamills, the profile milling time on sandy cast steel pump brackets was recently reduced by 79% at the DeLaval Steam Turbine Company. Speeds and feeds were increased and a high micro-inch finish was produced. The machine used was an Ingersoll planer type 75-hp mill. Instead of two sets of cutters, as had been required when high-speed steel was used, the same cutters were used for both roughing and finishing.

Because of the three to four-hour reconditioning time on cutters, which followed frequent cutter changes, production rate was low.

However, with the 12" "Universal" face Kennamills, the job is now run with increased feeds and speeds—12 ipm roughing and 7 ipm finishing while the sfm is 300 for roughing and 600 to 700 for finishing. Depth of cut is ¼" to ⅜" on roughing and 0.030" on finishing.

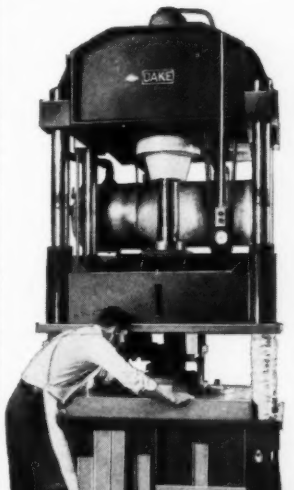
Cutter life is now 5 pcs/grind, using the same cutters for both roughing and finishing. The time for reconditioning a cutter has been reduced to one hour.

A more desirable finish of 40 to 60 micro-inches is now possible as compared to the 75 to 125 micro-inch finish attained through the use of the high-speed steel cutters.

Kennamills are made by Kennametal, Inc., Latrobe, Pa.

One of the largest distributors of metals in the Mid-West, Hubbell Metals Inc., St. Louis, has opened a plant in Memphis, Tenn. In addition to handling complete stocks of steel, brass, copper, etc., the new plant will provide a cutting and shearing service. The Memphis manager is Howard Broemmelsick.

JOIN THE MARCH OF DIMES JANUARY 3 TO 31



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The experience of Michigan Machine and Tool Co. duplicates that of many other custom die shops who have installed a Dake Die Try-Out Press

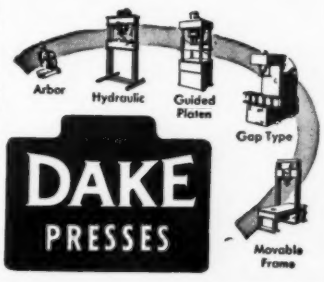
Michigan Machine & Tool Co. of Grand Rapids earned an enviable reputation as diemakers for a number of important manufacturers, but they were limited to building smaller size dies for lack of try-out facilities.

"We found it quite impractical," they said, "to interrupt a customer's production while we tried out a die on his press."

Since installing a Dake Die Try-Out Press, Michigan Machine & Tool Co. is being commissioned to make more dies, and bigger dies . . . bringing a substantial increase in business and correspondingly in profits.

Information on Dake Die Try-Out Presses is contained in Bulletin No. 330 . . . send for a free copy today.

DAKE CORPORATION, 634 Seventh St., Grand Haven, Mich.



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CIRCLE INFORM-A-GRAM KEY NO. 1351

Axelson Produces 32" Engine Lathe

Increased horsepower, higher spindle speeds, and greater range of feeds have been embodied in the new 32" engine lathe introduced by Axelson Mfg. Co., Los Angeles 58. It's designed to take advantage of all the cost saving devices presented by the latest knowledge in the metal working field.

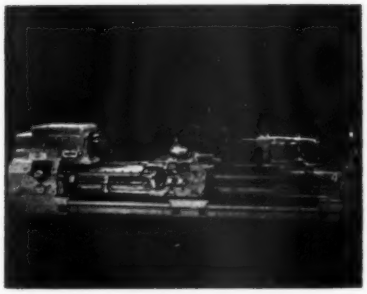
This machine has a full 75 hp for extremely heavy hogging cuts that removes metal at less cost. Its greater structural rigidity permits increased horsepower.

A horsepower indicator allows the selection of feeds and speeds to use the motor's maximum output. The lathe offers a range of spindle speeds from 6 to 750 rpm, and a selection of 81 feeds.

A full range of threads may be cut from 1 to 30 T.P.I. Any combination can be had through change gears located in the back of the machine.

Serrated clutches feed power through precision gears to the cross feed screw. Smooth power enables the cross feed slide to repeat work diameter to 0.0005", if necessary.

A newly designed taper attachment has an oversize close-coupled swivel block with take-up gibs. Longer travel of 30" and a greater taper/ft. means a greater work range.



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CIRCLE INFORM-A-GRAM KEY NO. 1361

Alternate Design is Announced for Hamilton Hobber

Now, it is no longer necessary to scrap existing work holding fixtures to utilize the Hamilton Hobber's feature of independent selection of speeds, feeds, and indexing. An "alternate" design for the Hamilton No. 1 small gear precision hobbing machine has been announced.

The new feature is optional at no extra cost. It adapts the Hamilton Hobber to the use of existing tooling regardless of style or make of hobbing machine for which it was constructed.

For full details on this "alternate" design, write to The Hamilton Tool Co., Ninth and Hanover Sts., Hamilton 4, O.

WELDERS LEASE PLAN

Standard and special design resistance welding equipment is now offered on a lease basis by Progressive Welder Sales Co. of Detroit.

The new plan, according to J. F. McRoberts, Progressive Vice President and General Manager, makes it possible for many manufacturers to obtain immediate possession and use of specially designed resistance welding equipment without impairing working capital.

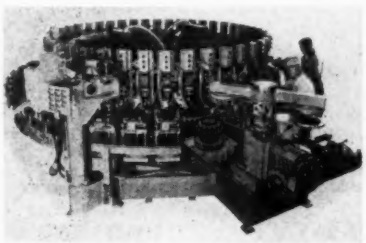
Similar equipment leasing programs have proven highly successful for both manufacturer and user in other fields. With a small cash outlay the equipment obsolescence problem is eliminated by leasing needed equipment.

LOADER AND INDEXER COMBINED IN A SINGLE UNIT

By providing a geared power takeoff on a standard swinging arm machine loader, a single unit has been created that can load, unload and index a dial table.

The combined unit was first developed to unload and rotate a 16' dia table that weighs over 15 tons. The mechanism indexes the 42-station table in two seconds and at the same time unloads a finished part from the table to an outgoing conveyor.

The unloading action is performed by two horizontal arms that are carried on a vertical shaft. Spring closed work clamps mounted on the end of each arm are so arranged as to slip over and grip a workpiece



when brought down on it at the unload station. Then the arms lift and rotate through 180°, bringing the workpiece to a position over the outgoing conveyor where the arms lower and the clamp presses against a fixture that releases the workpiece into the conveyor. While one arm is releasing its workpiece, the other arm is picking up another workpiece. The dial table is indexed by the same motion that rotates the arms.

The mechanism may be equipped with various gear ratios to provide any number of indexes per revolution, and the clamps may be designed to handle a wide variety of workpieces.

By providing two spaced clamps on each arm, the mechanism can be adapted to both load and unload the dial table.

The basic mechanism of the loader-index is Hautau's standard cam actuated box, built by Hautau Engineering Company, 721 Wanda, Detroit 20. It is powered by an electric motor that drives through an electric clutch, an electric brake and a geared speed reducer.

The clutch and brake are constructed so that the unit may be started and stopped at any point in an automatic cycle upon receiving a signal from the other machines.

The shapes of the cams are derived from cycloidal functions so that the table is indexed and the parts are unloaded in a minimum of time with negligible jerk.

The cams drive a pair of slides that move over hardened and ground shafts on preloaded ball bushings. One slide actuates the vertical motion of the arms and the other rotates the arms and the index table.

This model of the Hautau loader floor mounts on a heavy steel base that needs a floor space of 2'6" x 3'.

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ACME Multiple Application HYDRAULIC PRESS

It's Simple!

a youngster can operate it!

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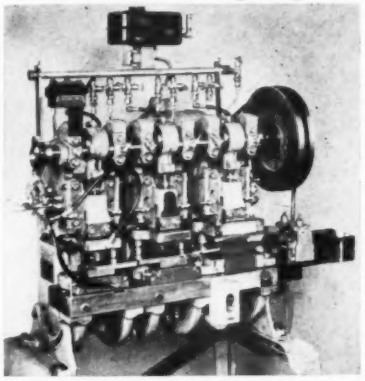
CIRCLE INFORM-A-GRAM KEY NO. 1371

Small-Press Builder Converts Standards for Special Needs

Because all types of standard machine tools are necessarily designed to fulfill the widest possible range of applications, the "special" requirements of some users must necessarily be met by compromise. Over the years, unusual customer requirements have been welcomed by Benchmaster Manufacturing Co. with many novel adaptations, refinements or conversions of existing Benchmaster products to better fulfill special functions.

Typical of these was one manufacturer's need for a low tonnage punch press having an unusually wide opening between columns and extremely large bed dimensions. Except for these, all other requirements were adequately met by a standard low-tonnage Benchmaster. By successfully redesigning the column pattern, a special press was developed utilizing standard Benchmaster parts elsewhere. Thus, a tough problem was solved at minimum cost.

Similarly, another customer's product utilized a high tonnage press equipped with an expensive progressive die for a multiple stamping and forming operation. Downtime for die maintenance was costly. Benchmaster's answer was three small standard Benchmaster presses simultaneously operating off a single custom-built crankshaft. The die was split up into three sections, each one mounted on its own Benchmaster bed. Since sharpening was mainly confined to one station, a spare die was substituted, when needed at this station to avoid excessive downtime. With a far lower investment in machinery, considerably greater production was obtained due to added press time and the higher speed of Benchmaster ram action.



This group of Benchmasters all operate off a common crankshaft. The setup eliminates need for an expensive progressive die and large capacity press.

Now, to meet a greater variety of "unusual" requirements, Benchmaster's new Special Machinery Division at Gardena, California has been organized to engineer and custom-develop special machines related to the present line of milling machines, punch presses, Koil Kradles, roll straighteners or accessory equipment made by the company.

PERKINS
POWER PRESSES
FOR HIGH PRODUCTION

Use the right type of press for your work.

We show a few of the many styles of presses available. We offer you presses with specifications to meet your particular requirements at standard prices. Presses equipped with the latest developments in air operated clutches for maximum production and speeds. Single and double feed rolls and dial feed attachments for safe, automatic fast production.

Address all inquiries to Dept. TP-12

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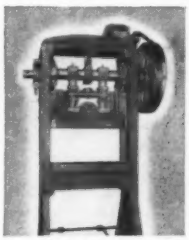
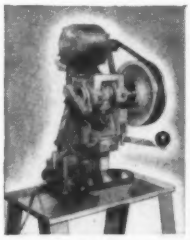
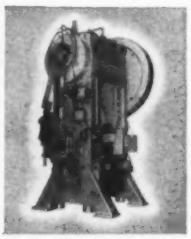
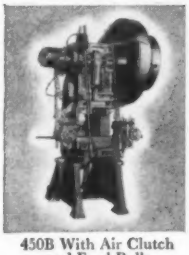
Perkins Power Presses SINCE 1885

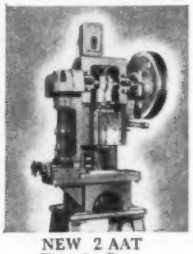

2H Plain Press Double Crank

550B Standard Press


Junior Press with Roll Feed


12-H-36 Plain Press with Air Clutch. 200 Ton Cap.


450B With Air Clutch and Feed Rolls


NEW 2 AAT Transfer Press

PRESSES BUILT TO SPECIAL SPECIFICATIONS

CIRCLE INFORM-A-GRAM KEY NO. 1381

Niagara President Munschauer Dies

Frederick E. Munschauer, Sr., 70, president and general manager of Niagara Machine & Tool Works, Buffalo, N. Y., died Oct. 22. Father of Frederick, Jr., vice president in charge of manufacturing and industrial relations, Mr. Munschauer had been active in the machine tool industry for nearly half a century. He was responsible for many developments and improvements in mechanical presses, shears, and other sheet metal fabricating machines.

Redesigned Tool Reduces Breakage and Wear Problem

By redesigning peening tools and adding carbide tips to them, International Business Machines Corp., Endicott, N. Y., recently eliminated rapid peen wear, and solved the problem of high-rate tool breakage in riveting operations involving counter plates used on electric accounting machines.

The problems at IBM stemmed from an attempt to increase production in the assembly section, where 14 separate riveting operations are performed to assemble the counter mounting plates. The riveting machines are set to operate at 3200 impacts per minute. With steel peens only 60 plates could be assembled before the peens wore out of shape and had to be replaced.

Peen wear practically stopped cold when IBM engineers applied standard Carboloy grade 55A cemented carbide blanks to the peening tools.

Closeup of peening operation in counter plate assembly section of International Business Machines Corp., Endicott, N. Y. Note how peen tipped with Carboloy grade 55A carbide is used with special fixture. Rivets are at right. Inset shows old-style peen, below, and redesigned, tapered peen above, both carbide tipped.

But licking one problem brought about another. The exceptionally long service life of the carbide-tipped peens created a fatigue problem that led to shank breakage, often enough to cause machine shutdowns and production losses. The point of failure usually was at the sharp shoulder below the threaded portion of the shank.

At the suggestion of a riveting machine operator, a slight taper was machined on the peening shanks between the face and threaded portion. That did the trick—leading to the current high production rates.

AWS and ASM Name Award Winners

Leaders in the welding field were honored at the national Fall meeting of the American Welding Society in Philadelphia. The Samuel Wyle Miller Medal was presented to John J. Chyle, director of welding research at A. O. Smith Corp. Nikolajs Bredzs was awarded the Lincoln Gold Medal for his article, "Investigation of Factors Determining the Tensile Strength of Brazed Joints". He is with Armour Research Foundation. Monroe Edwards received the A. F. Davis Undergraduate Welding Award for the best student paper on welding to appear in an undergraduate publication. He is at Georgia Institute of Technology. William Spraragen, director of the Welding Research Council, was given an honorary membership in the American Welding Society. The Adams Honor Lecture was presented by La Motte Grover of Air Reduction Sales Co.

The American Society for Metals 1955 Gold Medal went to Alfred L. Boegehold, assistant to the vice president in charge of General Motors research staff. He was cited for his great versatility in applying science to the metal industry.

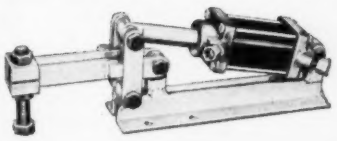
HEAVY-DUTY AIR (or Oil) CLAMPS

Never send a boy TO DO A MAN'S JOB

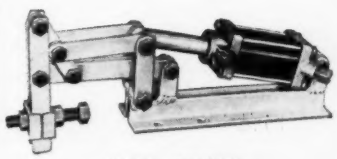
If you are developing a fixture to hold an automobile panel or other large assembly, it's a good idea to have the clamps rated to the job they're expected to do. In other words, never send a boy to do a man's job!

You can get husky, heavy-duty clamps from Lapeer—clamps which are built to stand up under the knocks and abuses of busy production lines. These clamps are air or oil operated—designed to grab tightly, let go quickly. Failure of air or oil pressure will not release the clamps, thus eliminating the possibility of scrappage.

Pictured are just two of several heavy-duty models available.



AO—400 (HD)



AODT—400 (HD)
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CIRCLE INFORM-A-GRAM KEY NO. 1391

GROWING PAINS

A new plant has been opened for the design and manufacture of precision springs by **Perfection Spring Manufacturing Company** in Chicago.

A new plant costing about $300,000 is being built for **Etna Machine Company,** Toledo, to replace its present factory. The company manufactures heavy duty tube mills, tube cut-off machines, and swaging machines.

◆

Grobet File Company of America, Inc., has moved offices, factory, and warehouse from New York City to a new building in Carlstadt, N. J. The move gives the company more space, including additional adjacent acreage for future expansion. Grobet manufactures rotary files, countersinks, and other industrial tools.

Ground has been broken for additions to the **Square D Company's** Milwaukee facility and to the Molded Insulation Division plant, Peru, Ind. A factory is now under construction at Royal Oak, Mich., to supplement the manufacturing facilities of the Distribution Equipment Division in Detroit. Another new plant recently began operations at Secaucus, N. J. Square D produces electrical distribution and control equipment, including automation components.

◆

A $2,000,000 expansion program of the Scintilla Division of **Bendix Aviation Corporation** will be completed by the end of this year. The facilities now under construction cover 25,000 sq. ft. and will be devoted to manufacturing as well as research on many types of electrical equipment.

◆

The de Silvey Corporation, specialists in rebuilding and reconditioning Warner & Swasey lathes, has moved into larger quarters in East Aurora, N. Y. The new plant occupying 20,000 sq. ft. of floor space, will allow the company to integrate all of its rebuilding operations.

◆

A new division in Toronto, Ontario, has been opened by **Wesson Company,** Detroit. This is the third major expansion for the company within 12 months. Wesson is one of the leading U. S. producers of cemented carbide metal cutting tools.

◆

Detroit Reamer & Tool Company has moved into a new plant and offices located at 780 W. Maple Rd., Birmingham, Mich. About 14,000 sq. ft. of floor space nearly doubles the former production area. The company manufactures special cutting tools, standard drills and reamers, and grinding attachments.

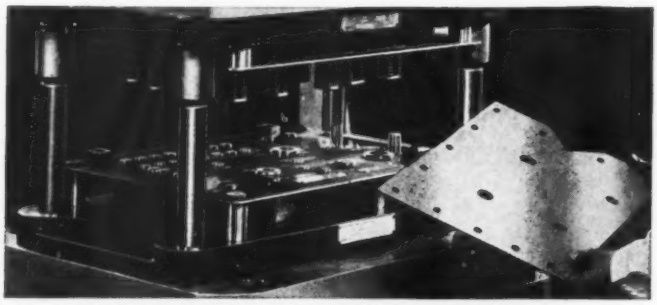
◆

Pilot operations will start this fall at **General Electric Company's** multi-million dollar plant near Roanoke, Va. The building will house manufacturing and office facilities for the company's Industry Control Department which is headquartered in Schenectady, N. Y. The new 600,000 sq. ft. plant will be completed in January and transfer of operations will take place gradually.

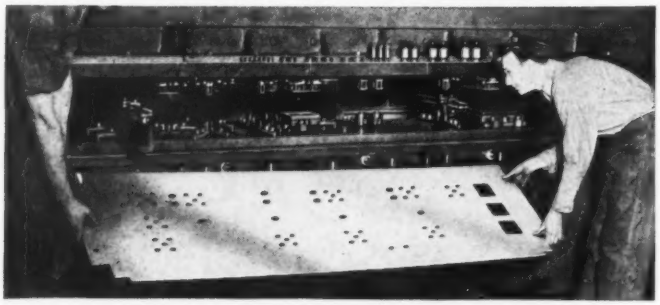
◆

To meet a rising demand for hydraulic pumps used in power steering for autos, **Eaton Manufacturing Company,** Cleveland, has announced a $1,250,000 expansion of its pump division plant at Marshall, Mich. About 2,100 sq. ft., of space, together with necessary equipment, will be added. The company produces automotive and aviation parts.

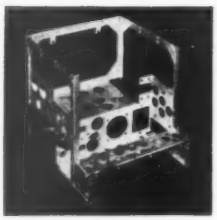
OVER 2,000 PLANTS *are making up their Metal Perforating Die Sets by Whistler methods*



WHISTLER MAGNETIC PERFORATING DIES



WHISTLER ADJUSTABLE PERFORATING DIES



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CIRCLE INFORM-A-GRAM KEY NO. 1401

SEQUENCE PROGRAMER EASILY SELECTS WORK CYCLES

Automatic electronic sequence programing equipment providing increased versatility for Monarch lathes has recently been developed and makes available easily selected, fully automatic work cycles for volume production of precision pieces.

While this equipment is presently arranged to actuate the well-known Monarch 10" Series EE lathe, built by Monarch Machine Tool Company, Sidney, Ohio, it can be made applicable to any appropriate lathe in the Monarch line.

Key unit in the numerical sequence programing equipment is the electronic control panel. This panel incorporates simple push-type selectors which are used to preset the various operations desired from the lathe for the particular workpiece to be turned. Once the proper sequence is programed with the selectors, a touch of the start button by the operator sets in motion up to 5 automatic work cycles using as many as 5 varied spindle speeds and 5 different feed rates. Any number of identical workpieces may be turned in succession without further adjustment of the control panel.

Functioning in conjunction with the electronic control panel is an analog-to-digital converter connected to the machine's carriage motion. The converter sends electrical impulses to the control circuits at precise points in the automatic work cycles, thus actuating the various operations called for by the panel selectors.

Changing the programer of the lathe from one sequence of automatic operations to another completely different sequence is both fast and simple. All that is required is a revision in the setting of the control panel selectors. The selector settings can be changed manually by the foreman or operator; a master board can be used which will simultaneously depress the required selectors when placed in contact with the control panel; or punched cards computed by the plant methods department can be slipped over the selectors to show, through the punched holes, the exact pattern to be set for a given operation.

A special control cabinet is utilized to mount the electronic control panel and related electronic equipment. Casters attached to the cabinet base enable the operator to move the unit to suit his convenience. All electronic components housed in the control cabinet are arranged on removable plug-in chassis. This greatly simplifies servicing and maintenance, according to Monarch engineers, by allowing the quick installation of a duplicate chassis while the original assembly is being worked on. As a safety measure all plug-in chassis are electrically interlocked, so that the removal of any chassis from the cabinet will immediately shut off the machine.

The air gage tracer used with the numerical sequence programer is of well-known Monarch design, but incorporates a new dual template system. With the dual template, tracer control is provided for both the last rough cut and the final finish cut. Shifting from the rough to the finish template is controlled automatically by the programer. Automatic-positioning positive stops on the cross slide regulate rough cut depth during the automatic work cycles prior to actuation of the tracer control.

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One low-cost kit checks all standard grooves through 5"!

- The Bryant groove gage offers incomparable accuracy and speed at low cost

No bearings or slides to wear — (no scissors action).

- Complete kit includes four pairs of segments to check "O" ring grooves through 5" dia. and four pairs of segments to check snap ring grooves through 5" dia. — immediate delivery from stock.

Segments for checking special grooves available.

Bryant bench-type gages to measure internal threads, external threads and squareness of face as well as portable gages for checking internal threads are also available.

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CIRCLE INFORM-A-GRAM KEY NO. 1411

PLASTICS FORM LOW-COST MACHINE TOOL HOUSINGS

New housings for machine tools are made of reinforced plastic and produced with plastic tooling for savings estimated at 20% to 40% or more. The new lightweight housings also save time and labor in repair or maintenance of the heavy, complex machine tools.

The low-cost fabrication of machine tool housings, developed by Gisholt Machine Company, Madison, Wis., is based on the use of plastics throughout the production cycle. Production molds and fixtures are made with Toolplastik epoxy compounds supplied by Rezolin, Inc., Los Angeles, Calif., utilizing Bakelite epoxy tooling resins. Bakelite polyester resins, reinforced with Fiberglas, are used for strong, lightweight structural members of the machine.

The all-plastic production technique drastically reduces costs by eliminating time-consuming operations that require highly skilled operators. The basic simplicity of plastics fabrication, its easy adaptability to changing conditions, and its advantage in weight-saving without sacrifice of strength or utility, help to shave production costs even more. Bakelite epoxy and polyester resins resist acids, grease, oils, moisture and most chemicals used by the machine tool industry. These plastics also have excellent electrical characteristics and mechanical strength. The reinforced plastic housings are self-extinguishing, do not warp or change their shape under most weather conditions, and they resist the abrasion of flying chips or shavings.

All plastic production saves about 30% of the cost of housing parts for a Gisholt vertical automatic lathe. Dimensional stability of these compounds maintains the uniformity of

Fig. 1. To fabricate the plastic housing, a release agent is first applied to the surface of the mold over which strips of Fiberglas cloth are laid and then polyester resins brushed on as shown in the illustration.

Fig. 2. The production mold serves as a fixture to position the piece for trimming off the rough edges.

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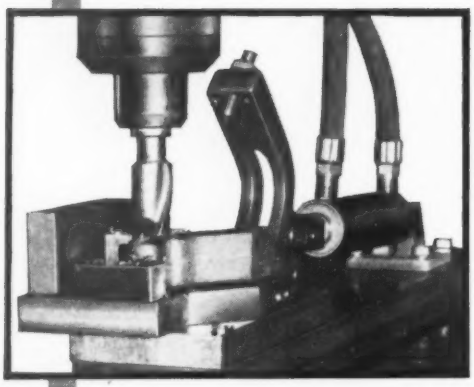
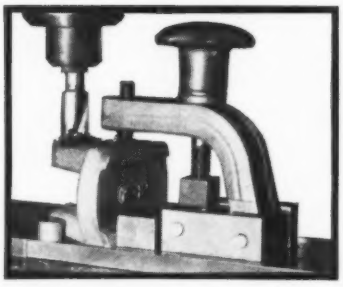
RETRACTING CLAMPS



Air Automation

As fast as air, as rigid as a bar of forged steel. Lodding's new Retracting Clamp is self-retracting and adaptable to all work. Four sizes, four types.

For rapid hand clamping, too. Quick as a flick of the wrist, a quarter turn of the screw, and a natural arm movement brings clamp to work and clamps — another quick movement releases work and retracts clamp.



Available with hand knob, cam or nut.

Factory Warehouse

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LODDING, Inc.

WORCESTER 1, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1421

Fig. 3. The five reinforced plastic panels to house the lathe motors come from the mold with a finished surface that requires no machining, sanding, chipping or grinding. The total weight of the five cover components is about 37 lbs, making their installation an easy operation.

the mold through widely varying temperature and humidity.

To fabricate the housing, Figure 1, a release agent is first applied to the surface of the mold. Fiberglas cloth is laid up in strips in the mold and polyester resins brushed on. By covering the mold cavity with a translucent film bag from which air is withdrawn by pump, atmospheric pressure forms the reinforced plastic in the mold. Infra-red lamps are used to harden the resin, and, when cool, the part is stripped from the mold. This production mold also serves as a fixture to position the piece for trimming off rough edges, Figure 2. The five reinforced plastic panels to house the lathe motors, Figure 3, come from the mold with a finished surface that requires no machining, sanding, chipping or grinding. Their total weight is about 37 lbs, Figure 4. The same panels in cast iron would weigh more than 300 lbs or about 120 lbs in aluminum.

The lightweight housing for this vertical automatic lathe, Figure 5, is made of reinforced plastic with plastic tooling to save on repair and maintenance as well as production costs. Strong yet light in weight, the reinforced plastic housing panels are simply buttoned in place instead of bolted or hinged like heavy metal panels. The topmost motor housing, for example, can be lifted off by hand whereas the cast iron housing would require a chain hoist to remove it. Production downtime and work time for maintenance and repair are both reduced by the easily handled housing panels.

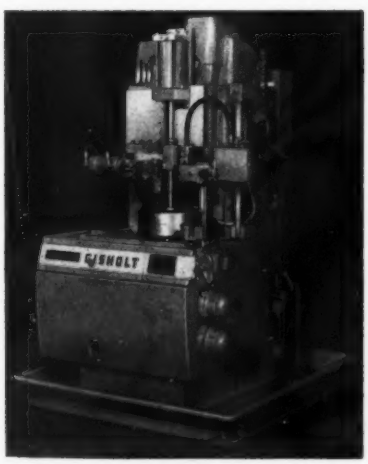

Fig. 4. The plastic front and side panels and the motor cover are shown in place on a Gisholt vertical automatic lathe.

JOIN THE MARCH OF DIMES JANUARY 3 to 31

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1062 Press Brake $2,190

Verson standard press brakes, Model 16-48 with 16 ga. by 48″ capacity priced at $1,455.00* and Model 1062 with 16 ga. by 78″ capacity priced at $2,190.00*, *are immediately available from stock!* There are no involved proposals, no long waits . . . it's as simple, quick and convenient as ordering from the corner grocer . . . Verson standard press brakes right "off the shelf."

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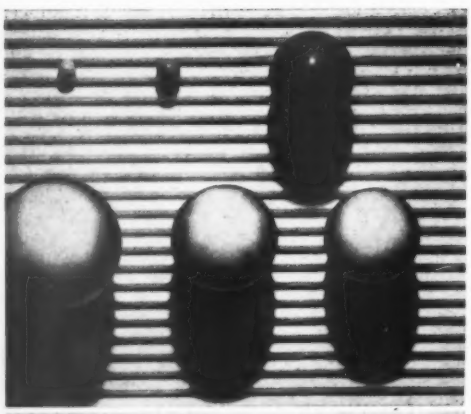
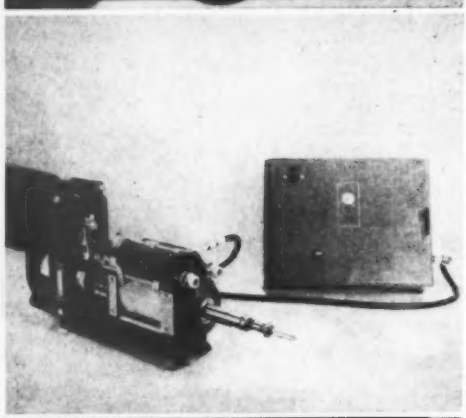
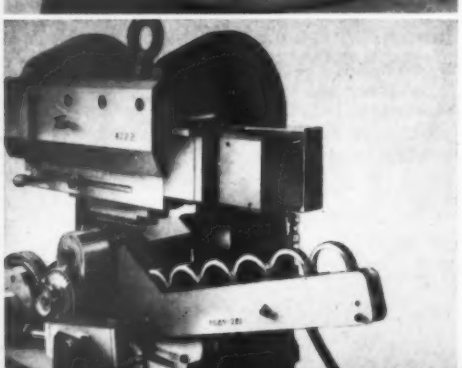
CIRCLE INFORM-A-GRAM KEY NO. 1431

PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS







CERAMIC BALLS . . .

Precision balls of ceramic materials such as aluminum and magnesium silicates, titanium dioxide, and aluminum oxides are now available. Ideal for applications requiring resistance to corrosion, abrasion, or high temperatures, they can be furnished in standard or special sizes from ¼ to 4½". Industrial Tectonics, Inc., Ann Arbor, Mich., or—**Circle A1.**

DRILL UNIT . . .

A new automatic reversing control unit permits high production tapping or drilling using Model 24 Holomatic unit. The tapping capacity is ¾-16" in mild steel and the drilling capacity is ⅝" in similar material. Hause Engineering, Montpelier, O., or — **Inform-A-Gram No. A2.**

AUTOMATIC MACHINE OPERATIONS . . .

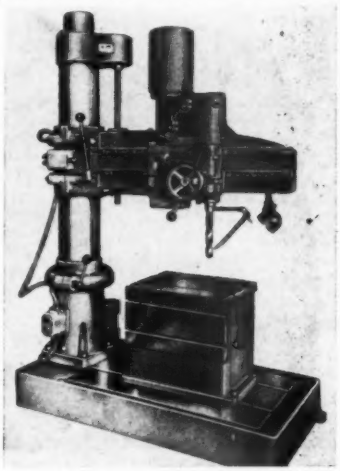
A dial index feed is used on punch and drill presses, converting a standard machine to almost full automation. The accessory operates at rates up to 6000 strokes/hr. Punch press operations include automatic marking, reaming, trimming, crimping, etc. Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or — **Inform-A-Gram No. A3.**

AUTOMATIC MARKING . . .

Roll identification on bearing races at the rate of 1500 to 2500/hr with an automatic marking machine. Since all components requiring marking vary in size and shape, the unit is only built to order. The cycle is timed by a Geneva motion. Geo. T. Schmidt, Inc., 4112 Ravenswood Ave., Chicago 13, or — **Inform-A-Gram No. A4.**

40" RADIAL DRILL . . .

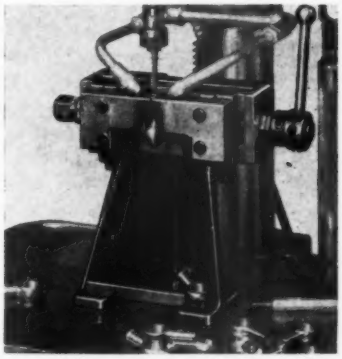
A 40" radial drill features a spindle with a patented drill ejector so that drills can be removed without the use of a drift punch. The drill has a direct



gear drive motor and a spindle with 1¾" drilling capacity. Masters' Precision Tools, 3613 Archer Ave., Chicago 9, or — **Circle Inform-A-Gram No. A5.**

ACCURATE WORK-HOLDING JIG . . .

An automatically self-centering workholding device will hold within 0.0015" or better accuracy. The John's Drill Jig is ideal for precision cross or end drilling of round, hexagon, or square stock, or standard or odd shaped smooth or rough castings, from ⅛" to 8" O.D. It can also be used



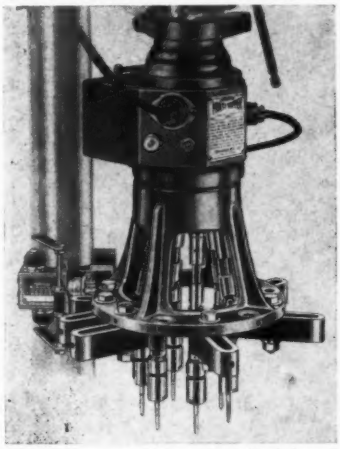
as a milling vise and for drilling and tapping. This device provides for rigid clamping of work, fast chucking, adequate chip room, and great economy on short or long runs. Heuser Mfg. Co., 1638 N. Paulina St., Chicago 22, or — **Inform-A-Gram No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

TAP 8 HOLES AT ONCE . . .

A multiple spindle tapping head can tap up to 8 holes in any pattern at once. The "Multi-Tapper" can be quickly mounted on any drill press and may be used with air or hand feed. This high production universally adjustable unit is available in Models 90 or 50. Tap capacity of each spindle on both models is ¼". Commander Mfg. Co., 4225 W. Kinzie St., Chicago, or—



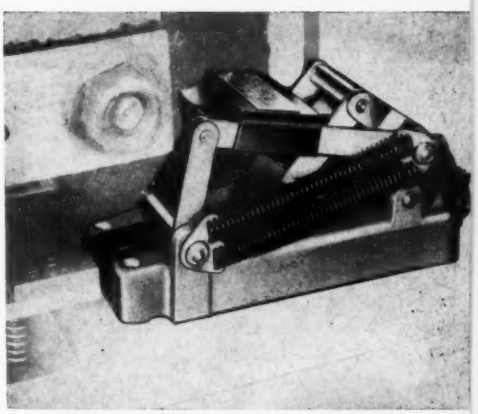
Circle Inform-A-Gram No. A7.

VERTICAL MILLING MACHINE . . .

"All-angle" milling, boring, and drilling can be handled by the Axelson Model 1½V ram type vertical milling machine. It has extra large work capacity and a wide range of spindle speeds from 50 to 6400 rpm, and manual or power spindle is rigidly constructed to take advantage of carbide cutting tools. Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58. **Circle A8.**

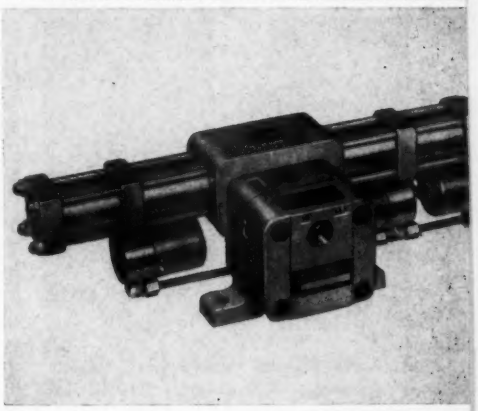
AUTOMATIC PRESS FEED . . .

Easy to install, a new low cost automatic press strip feed mounts on the dieset or press table of any type of mechanical, hydraulic, compressed air, or electrically operated press. A micrometer adjustment controls the feed travel length to ± 0.001" accuracy. Jaco Devices, Inc., 102 High St., Hingham, Mass., or — **Inform-A-Gram No. A9.**



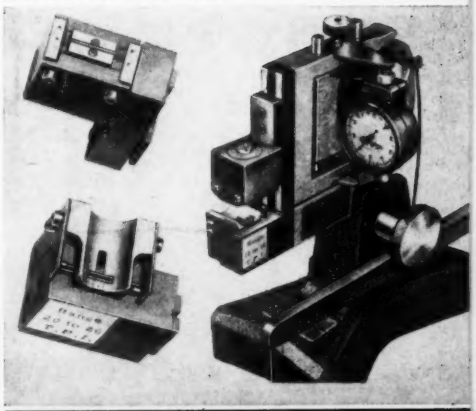
POWER OPERATED VALVE . . .

A four-way valve for air, gas, oil, or water service features power operation to forward, reverse, and neutral. Model PON is controlled by a three positioner power attachment. It is designed for remote control and automatic operation. Bulletin 1010 from Ladeen Mfg. Co., 1600 S. San Pedro St., Los Angeles 15, describes the valve. **Inform-A-Gram No. A10.**



3-WIRE MEASURING GAGE . . .

An instrument for the measurement of pitch diameter of threads has been announced by Standard Gage Co., Inc., Poughkeepsie, N. Y. Six sets of interchangeable jaws cover a range from 56 to 10 threads/in. and diameters up to 1". **Inform-A-Gram No. A11.**



SHAPER-PLANER . . .

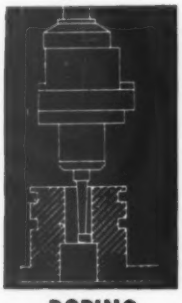
A new heavy duty hydraulic shaper-planer has been produced by Rockford Machine Tool Co., Dept. MM, 2400 Kishwaukee St., Rockford, Ill. It is built in four table sizes with stroke lengths from 6 to 20′ in increments of 2′. The shaper-planer will economically machine materials from free cutting types to the toughest steels. **Inform-A-Gram No. A12.**

A Boring Head That Won't Face is NOT Complete

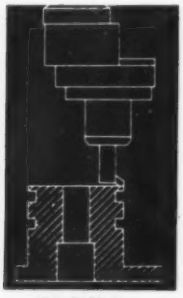
CHANDLER-DUPLEX Does ALL IN SET-UP

BORING
FACING
TURNING
GROOVING
UNDER-CUTTING

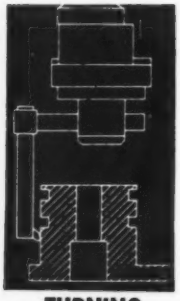
The CHANDLER-DUPLEX Combined Boring and Facing Toolhead has many features not found in ordinary makes . . . such as power feed for facing, longer slide travel, extremely fine adjustment, tee slot positioning of cutting bar, universal range and adaptability.



BORING



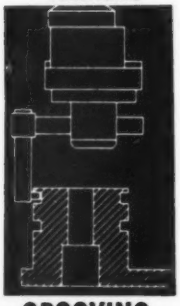
FACING



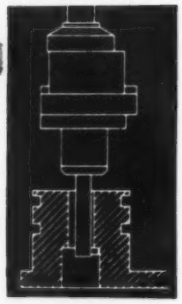
TURNING

CHANDLER-DUPLEX *combines* boring and facing — permits all these operations in one set-up. Built for efficiency, accuracy and stamina.

A Model for Any Size Machine



GROOVING



UNDERCUTTING

Write today for full details and Catalog on this combined Boring and Facing Toolhead

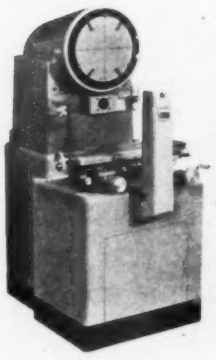
CHANDLER TOOL CO.
Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

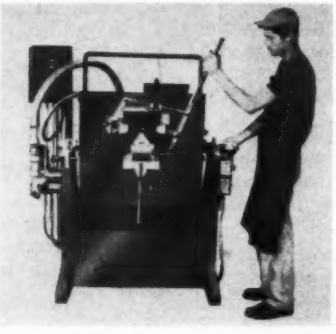
CIRCLE INFORM-A-GRAM KEY NO. 1461

The "Tapmatic 700" Tapping Attachment has a larger capacity, from ¼" to ½". It doesn't need any lead pressure during tapping. This "weightless tapping" principle insures longer tap life, consistently uniform tapped holes, and faster tapping production. It has a positive torque adjustment clutch and reversing mechanism. Tapmatic Corp., 845 W. 16th St., Costa Mesa, Calif. **No. A13.**

A New Contour Projector handles large, heavy parts. Model 14-5 combining maximum table travel and a 14" screen, can measure intricate parts to 0.0001". It can also be used for routing gaging by comparing the image of the part with a chart. Eastman Kodak Co., Special Products Sales Div'n, Rochester 4, N. Y. **No. A14.**

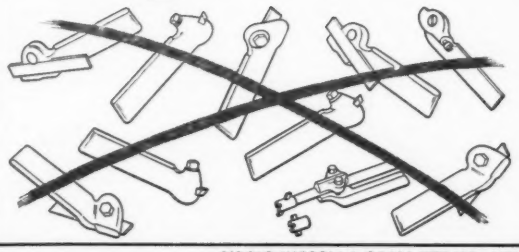


An Automatic Gravity Casting Machine permits manufacturers to make permanent mold castings in their own plants. The castings produced have a higher tensile strength plus a grain structure equivalent to a forging. Automation - Engineering Corp., 1127 Wilshire Blvd., Los Angeles 17, produces the "Grav-O-Matic". **Circle No. A15.**



An Electronic Duplicator has been designed for use with small lathes up to 16" capacity. Accurate to ±0.0015", the unit operates with an 8-oz stylus pressure. It eliminates gages and form tools and reduces the possibility of error. Model 2-422 is a single motion type duplicator. Raytheon Mfg. Co., Waltham 54, Mass., is the manufacturer. **Circle No. A16.**

ONE ALL-PURPOSE TOOL HOLDER INSTEAD OF TEN



ONE tool holder for all positions . . . No tool chatter . . . can do internal boring or internal threading . . . Ideal for carbide tools . . . Bit sizes: ¼", 5/16", ⅜", 7/16", ½", ⅝".

Furnished with Cobalt Bits

ELK TOOLS, Inc.
73 WEST BROADWAY
NEW YORK 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1471

HARDENED and GROUND HSS BLANKS

Any decimal diameter to ⅜"—in any length.
Mirror finish surface to gage tolerance.
Many uses—
—core pins, punches, gages, ejector pins, insert pins, special tools, etc.—Quick delivery.

Write or phone MIllburn 6-4222 for price list D-3

WILLIAM T. HUTCHINSON CO.
P O B 328, UNION, N. J.
Factory: Springfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1472

LUCAS TOTE PANS

HELP SOLVE PRODUCTION PROBLEMS!

Lucas Tote Pans are built for long wear and ease of handling. Designed for every shop use—storing materials, holding parts for convenient handling by machine operators and at assembly lines, Lucas Tote Pans are available in nesting type, stacking type, straight side and assembly or bench pans. Lengths from 10" to 32", widths from 5" to 23" in standard sizes. Other sizes made to your specifications.

For Further Information, Write

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DYKEM STEEL BLUE®

Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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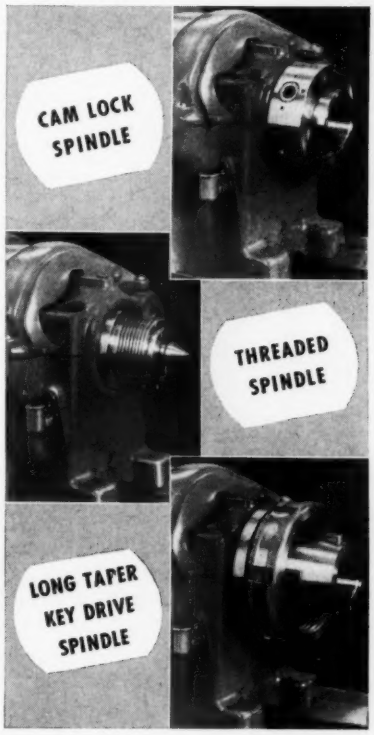
Your Choice

3 TYPES OF SPINDLES

ON SOUTH BEND LATHES



Extra Charges for Types L and D1 Spindle Noses

Lathe Size	Long Taper Type L Size 00	Cam Lock Type D1 Size 4"
10" — 1" C & Ser. 1000	$25.	$33.
13" — 1" Collet	38.	38.
14½" — 1" Collet	46.	46.
16", 16-24", 2-H	52.	52.

Greater interchangeability of chucks, collets and fixtures are yours with South Bend Lathes. All 10" — 1" Collet and larger lathes can be supplied with 4" Type D1 Cam Lock Spindles, Size 00 Type L Long Taper Key Drive Spindles or the regular threaded spindles as shown. Keep this in mind when buying lathes so you can better take advantage of the extra values you get in South Bend. Write for complete information on South Bend Lathes — also Shapers, Drill Presses, and Pedestal Grinders.

SOUTH BEND LATHE
South Bend 22, Indiana
Building Better Tools Since 1906

SOUTH BEND LATHES

CIRCLE INFORM-A-GRAM KEY NO. 1475

INSERTED BLADE GENESEE
FACING AND COUNTERBORING TOOLS

Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

H.S.S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
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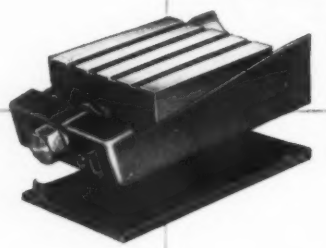
GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 1481

with EMPCO leveling jacks



MACHINES PERFORM BETTER!

Set your machines level—and keep them that way! That's the key to better performance and less maintenance! EMPCO Leveling Jacks provide a solid, adjustable support for machine tools, industrial furnaces, tool room and production equipment of all types. Easily installed and relocated, EMPCO Jacks keep your machines level and stable.

VI-SORB mounting pads are optional with EMPCO Jacks. They control vibration from within the machine itself, and reduce transmitted vibrations.

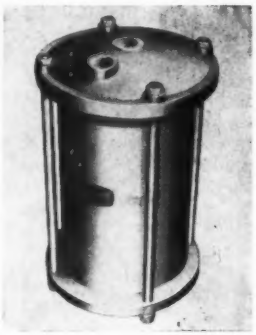
Available in two styles and 6 models, there's an EMPCO Jack for your every requirement. Write today for complete information and illustrated bulletin!

EMPCO PRODUCTS

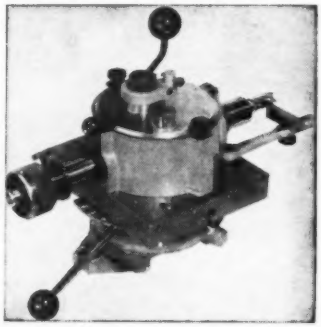
THE ENTERPRISE MACHINE PARTS CORPORATION
2735 JEROME AVENUE • DETROIT 12, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1482

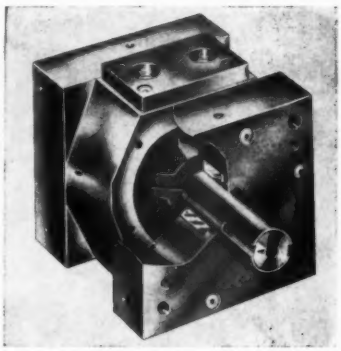
A New Line of Air Filters removes all traces of oil, all solid particles over three microns in size, odors and fumes, and moisture. Using "Super Clean" Series 350, there is more efficient operation, less down time, and much longer equipment life. The filters produced by Wilkerson Corp., 3395 S. Platte River Dr., Englewood, Colo., should be installed close to the actual point of use. **Circle No. A17.**



A New Grinding Head has an infinite number of motions in any direction. The Multi-Spiral Universal Grinding Head eliminates elaborate set-ups. It can be used for grinding form relief, back-off work, straight or spiral flute-grinding, and sharpening cutting tools. Spiral Step Tool Co., 5404 N. Damen Ave., Chicago 25, or—**Circle No. A18.**

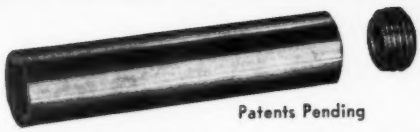


Turning, Opening, Indexing, mixing, or moving any type load or mechanism can be performed by a square shaped instant oscillating torque motor. The "Rotomation" motor is capable of 280° rotation of a shaft. The motor is produced by Roto-Mation Motors, Inc., 525 S. Riverside, St. Clair, Mich.
Circle No. A19.



Special Accuracy, finish, and operator safety are features of a semi-automatic Bullard abrasive cutoff machine. It cuts solids up to 2½" dia., squares 1¾", angles to 4", and tubing up to 4" O.D. The machine may be used wet or dry. A metal cover encloses the cut-off wheel during the upward cutting stroke. Lombard Governor Corp., Ashland, Mass., or—**Circle No. A20.**

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

Write for Literature

STURDY BROACHING SERVICE, INC.
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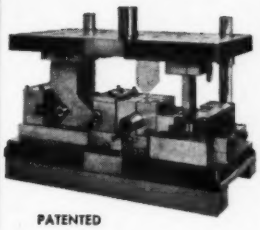
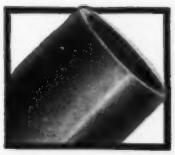
CIRCLE INFORM-A-GRAM KEY NO. 1491

FOR YOUR POWER PRESS

THE VOGEL TUBE CUT-OFF MACHINE



PATENTED



HIGH PRODUCTION: In your power press the VOGEL TUBE SHEAR cuts any diameter or wall thickness of tubing within range of machine from 1/3 to 1 second per cut.

MINIMUM BURR: Cuts square ends with minimum of burr.

LOW MAINTENANCE: Simplicity of design with few moving parts insures low maintenance. "Set-up" can be done by anyone with very little training.

INTERCHANGEABLE: Die blocks available to cut tubing sizes from ⅛" O.D. to 2" O.D.

AUTOMATIC STOP: Holds lengths to plus or minus .010" cut from any mill lengths of tubing.

No. 12 VOGEL CUT-OFF MACHINE
Takes tubing up to ½" O.D. x 3/32" wall.
No. 2 VOGEL CUT-OFF MACHINE
Takes tubing up to 2" O.D. x ⅛" wall.

SEND FOR SAMPLE CUTS AND DESCRIPTIVE LITERATURE

VOGEL TOOL AND DIE CORPORATION

1817 N. 32nd Ave. Melrose Park, Illinois
Fillmore 5-0160

CIRCLE INFORM-A-GRAM KEY NO. 1492

BRYANT GRANITE
ROCK OF AGES
SURFACE PLATES

unexcelled for wear resistance

Bryant Granite Surface Plates are finished on the "head" of the grain, a patented process. This feature ensures a long wearing surface of uniform density and durability.

Low in cost, Bryant plates are made from selected fine grain black and white granite and are ideally suited for inspection, layout and assembly work. Convenient stands featuring 3-point mounting for plates are available.

doubly guaranteed

Bryant, maker of precision machine tools and gaging equipment, unconditionally guarantees every plate for specified flatness.

Rock of Ages, the world-famous quarry, guarantees the granite itself, for perfect grain, close-knit composition and flawless texture.

Mail coupon for complete details!

BRYANT GAGE & SPINDLE DIVISION
Box 620 H, Springfield, Vermont

Gentlemen:

Please send me your free folder describing Bryant Granite Surface Plates.

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*Company*_____

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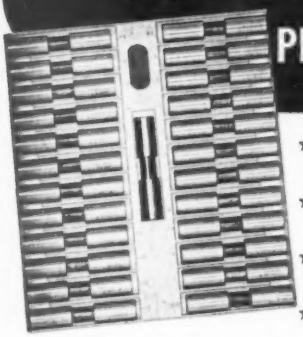
Groove Gages · Granite Surface Plates
DIVISION OF BRYANT CHUCKING GRINDER CO.

CIRCLE INFORM-A-GRAM KEY NO. 1493

CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths

★ Set of 25 costs approximately same as Go and No-Go gauge.

★ Available in increments of 1/64" from 1/8" to 1"

★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D1.

DELTRONIC CORPORATION
1507 RIVERSIDE DRIVE • LOS ANGELES 31, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1501

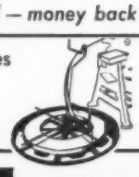
Powered by the press ram... independent of the die

2 SIZES Cuts steel up to 1/16" thick

3" WIDE $69 6" WIDE $95

Guaranteed — money back if not 100% satisfied

New LOW prices on the JACO AUTOMATIC STOCK REEL



WRITE FOR FULL DETAILS TODAY!

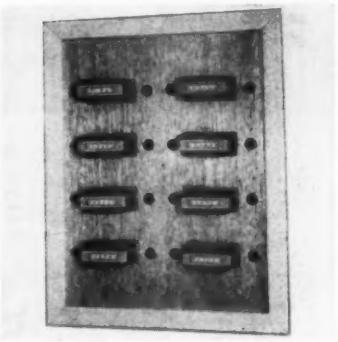
Dealer Inquiries Invited

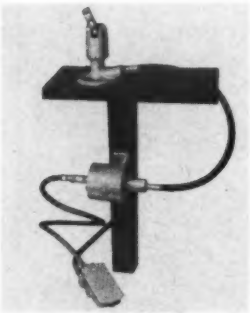
JACO DEVICES, INC.

96 HIGH STREET • HINGHAM, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1502

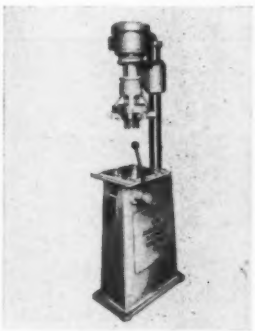
A Remote-Reading Control Panel records production of full-length parts on Brown & Sharpe automatic screw machines. It also shows if each machine is operating. The panel board is supplied in a complete size range. Count-O-Larm Co., 1271 W. North Ave., Chicago 22, or — **Circle No. A21.**





Remote Touch Control is a feature of a new air powered hydraulic work positioner. The new model, PowRarm No. 393 has a work weight capacity of 105 lbs. It contains a universal ball-and-socket arrangement free to move through all three planes. Pressing the foot pedal locks the PowRarm in any desired angle and position. Wilton Tool Mfg. Co. Inc., Schiller Park, Ill., or — **Circle No. A22.**

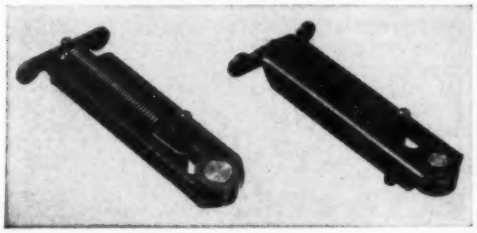
Multiple Small-Hole Drilling and tapping is performed by the new Cleveland Jr. multi-spindle drill tapper. It is designed for plants where production doesn't justify special equipment but where faster precision work is desired. Spindle speed is 2700 rpm. The tapper features fully automatic operation. The Cleveland Tapping Machine Co., Canton 6, O., or — **Circle No. A23.**



An Economy Model has been added to the Airflex line of floor and portable pneumatic "Spin-Impact" riveters. It's a vertical floor type designed for general riveting to a maximum of ¼" fasteners, based on solid mild steels. Impacts range from 8000 to 16,000 blows/min. It's also used for swaging, flaring, reducing, and enlarging. Lemert Engineering Co., Inc., P. O. Box 282, Plymouth, Ind., or—**Circle No. A24.**

FOR POSITIVE STOCK ALIGNMENT

IN PROGRESSIVE DIES



Amcor Roller Stock Pushers

SPEED UP PRODUCTION with precision-made AMCOR Roller Stock Pushers. Easy, smooth stock feeding, without buckling, assures more production with less operator fatigue.

SAVE MONEY. AMCOR Roller Stock Pushers sell for just a fraction of what hand-made bench models cost to make.

SIMPLE TO INSTALL. Requires only a slot milled in the stripper plate, and a hole drilled in the die block and stripper plate. Tracing template for slot and hole location is supplied. When die is sharpened, no refitting is necessary.

The AMCOR Roller Stock Pusher is quickly adaptable to any work specifications. Distributors throughout the country stock a complete line of nine models to fit all production needs.

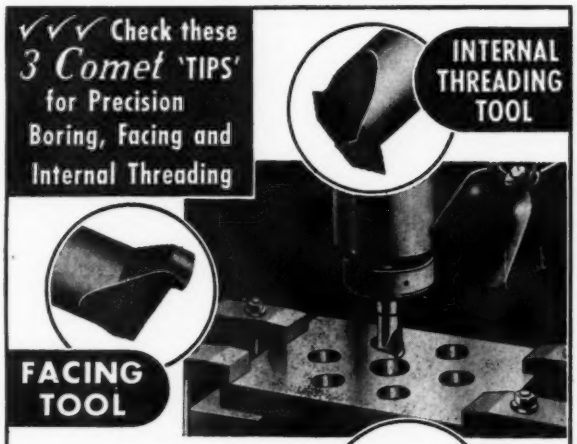
Write us for complete information

APPLIED MECHANICS CORPORATION

460 LYON, N. E. GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1511

√√√ Check these *3 Comet* 'TIPS' for Precision Boring, Facing and Internal Threading



Made of HIGH SPEED or CARBIDE

FOR HOLES FROM 1/16" UPWARD

17 DIFFERENT SIZES

- CONSTANT SHAPE & CLEARANCE
- FAST PERFORMANCE
- ECONOMY IN PRODUCTION
- EFFICIENT IN RESULTS
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE
- INDISPENSABLE FOR PRECISION BORING OF SMALL HOLES

COMET offers "SOLID CARBIDE INSERT" BORING TOOLS

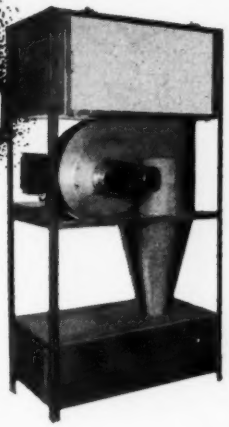
Made to Your Specifications

COMET Tool Co.

738-T BROADWAY • NEW YORK 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1512

EFFICIENT–LOW COST Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

37 STANDARD MODELS TO CHOOSE FROM

• READY TO USE

Also a Complete Line of Mist Collectors

AGET MANUFACTURING COMPANY

1394 E. CHURCH ST. • ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1513

The New Improved Fluid Feed ROTARY TABLE

Deftly holds and delivers small parts to drill, tap, swage, stake, etc. 8, 12 or 24 stations accurate to .003". Positive, uniform air-hydraulic indexing—not a mere hydraulic check. Indexes slow or fast, up to 2800 per hour. Compact and sturdy, easy to tool and hook up. Standard dial plate 12" x ½" ground steel. For a new job, simply tool up a new dial. Readily combines with "MEADMATIC" Timer, Air Hammer, Air Press, Drill Presses, etc.—to make almost completely automatic machines—operator merely loads.

Send for new Air Power catalog today!

(See Volume III Thomas' Register for nearest distributor's address, phone number.)

MEAD SPECIALTIES COMPANY

4114 N. Knox Ave., Dept. HA-125, Chicago 41, Ill.

PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 1514

CARBIDE TOOLS
Precisionized by
GRAWELL

Grawell craftsmanship is inherent in Grawell Solid Carbide Tools . . . years of experience is reflected in the precision and long service life of these fine drills, end mills, reamers, grinding tools, centerlaps and burrs.

WRITE FOR NEW CATALOG TODAY DEPT. TPS

GRAWELL CARBIDE TOOL COMPANY
5680 12th ST., DETROIT 8, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1521

HAND KNOBS
6 SIZES
CAST IRON

Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

Write for catalog

TIETZMANN TOOL CORPORATION
Dept. HK-2 • Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1522

ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO 12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long, dependable service.

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ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electrix Affiliate

CIRCLE INFORM-A-GRAM KEY NO. 1523

PRESSURELOK-224
the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

US

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 1524

Make 3 hammers AT ONCE!

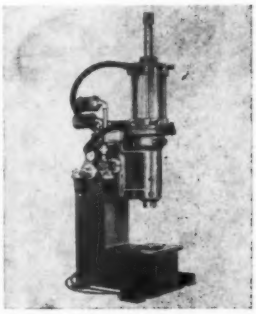
It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

COMPLETE LEAD HAMMER SERVICE

Write for circular and prices

LAWRENCE H. COOK, INC.
66 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

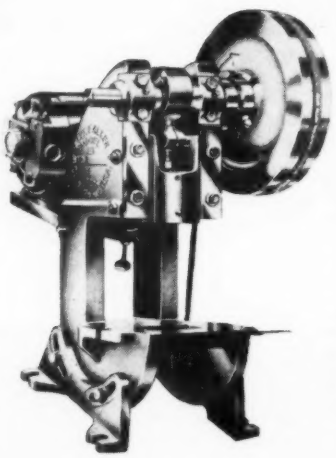
CIRCLE INFORM-A-GRAM KEY NO. 1525



A New Double Acting Air Press permits increased vertical heights, throat depth, and ram stroke. Extra heavy reinforced, double acting air cylinders support unlimited upper die weights and allow faster operating cycles. Ram housing is adjustable in 2" increments up to 6" total adjustment. Famco Machine Co., 3100 Sheridan Rd., Kenosha, Wis. **Inform-A-Gram No. A25.**

An Engraver Bench has been made to hold the Green Model D2 engraver. It is designed for the operator's convenience with all functional parts of the pantograph within comfortable reach. Recessed area with foot rest permits the operator to sit at a proper level. Green Instrument Co., 385 Putnam Ave., Cambridge. Mass.
Circle No. A26.

Eliminate All Chemical Cleaning with a new rotary automatic unit. It is capable of wet blast cleaning, rinsing, drying, and unloading at the rate of 1200 parts/hr. The unit is designed for cleaning electronic receiving tube leads in order to insure good welding bond. The Cro-Plate Co., Inc., 747 Windsor St., Hartford 1, Conn., or —
Inform-A-Gram No. A27.



Suited to Small Stampings is a 2-ton open-back inclinable power bench type punch press. Model BT-2 has an extra large die space for stamping, shearing, forming, blanking, etc. It has a mass production capacity up to 250 operations/min. It has exclusive straight ram guides with flat gib giving accurate fitting of dies for precision stamping. Alva Allen Industries, Clinton, Mo., or—**Circle No. A28.**

FRICTION SAWING

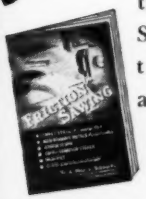
WITH

Tannewitz

HIGH SPEED BAND SAWS

GREATEST COST SAVER IN METAL CUTTING

Write for your free copy of "FRICTION SAWING" and get hep to the fact you can save thousands of dollars and much valuable time by friction sawing with Tannewitz High Speed Band Saws: Sheets of both hard and soft steel, formed or flat; trimming of malleable and steel castings; 1" armorplate and other materials. Write for the "FRICTION SAWING BOOKLET", right NOW!



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☎ GL-6-1729

SAWING MACHINERY SPECIALISTS

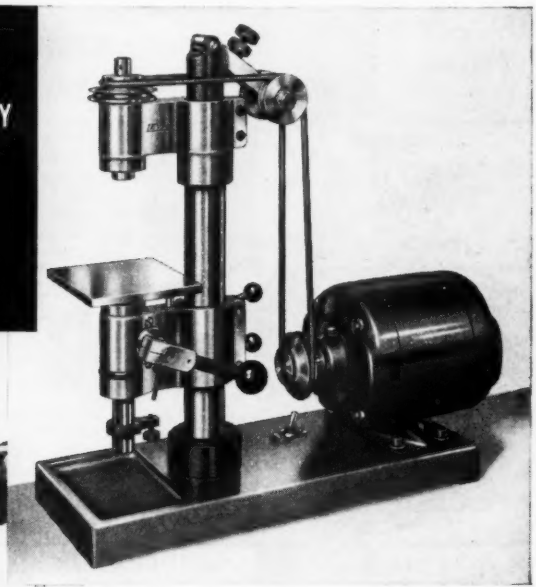
The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1531

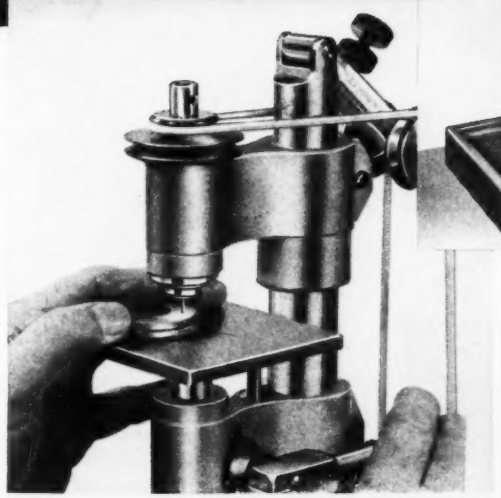
SMALL DRILLS MUST BE HELD
IN PRECISION COLLETS TO ASSURE ACCURACY

LEVIN ® MICRO-DRILL PRESS

FOR VERY SMALL HOLES
DOWN TO .002"



In the LEVIN micro-drill press drills are held in precision collets. Runout is reduced to practically zero and drill breakage from this cause is eliminated. Collets are available in a complete range of sizes down to .1 mm (.004").



Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

Send for catalog M describing complete line of micro-drilling equipment, collets, instrument lathes and precision tools.

LOUIS LEVIN & SON, INC.

3610 South Broadway • Los Angeles 7, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1532

Drill Hardened Steels without Annealing –

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

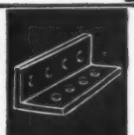
Also makers of—
BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS
Write for information

CIRCLE INFORM-A-GRAM KEY NO. 1541

First and Foremost
NOBUR'S *Job Tested* TEAM
for
★ DEBURRING
★ CHAMFERING

the NOBUR

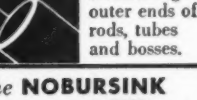
for machine deburring and chamfering of line-drilled and otherwise inaccessible hole surfaces.

for the automatic deburring and chamfering of front and back hole faces simultaneously in sheet metal, etc.

the NOBURMATIC

the NOBUROD

for rapid deburring and chamfering the outer ends of rods, tubes and bosses.

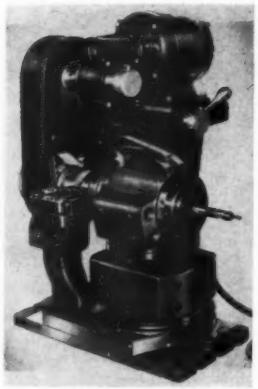
for rapid deburring and chamfering openly accessible hole faces.

the NOBURSINK


NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
6860 Farmdale Ave., No. Hollywood, California

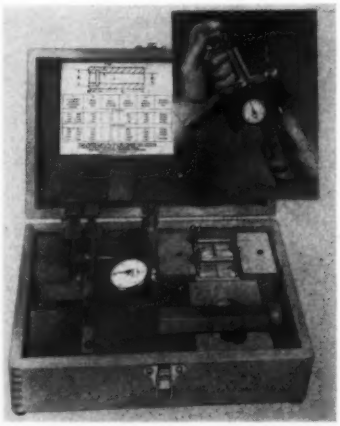
CIRCLE INFORM-A-GRAM KEY NO. 1542

Designed for Pre-Heating and stress relieving of magnesium and newer alloys is an automatic forced air recirculating oven. Tem-O-Loy ovens feature mobility, diagonal air flow, and exact temperatures to 1000°F. Alloy radiant shields are provided to insure faster heat transfer and uniform temperatures. Blue M Electric Co., 138th & Chatham St., Blue Island, Ill., or — **Inform-A-Gram No. A29.**



A Powered Model Universal Form Relieving Fixture has been developed. It is used for grinding a quantity of tools of one design at a time. A compact drive delivers a constant high torque output at any speed from 0 to 80 rpm. Model R-O produces grinds equal or better in quality than hand grinding. The fixture is manufactured by Royal Oak Tool & Machine Co., 29800 Stephenson Hwy., Royal Oak, Mich. **Circle No. A30.**

Useful for Prick-Punching the intersections of scribed height gage lines and for marking photo-etched templates is a new micro-punch. With an accuracy of better than 0.001", it will mark flat surfaces for precision drilling. It combines a microscope with an automatic center punch. Moran Instrument Corp., 170 E. Orange Grove Ave., Pasadena 3, Calif. **Circle No. A31.**



A Portable Groove Gage in a low-cost package unit complete with sets of segments has been introduced. It has no bearings or slides to wear. All the motion is confined to spring steel reeds. The kit contains eight pairs of segments. Bryant Gage & Spindle Div'n, Bryant Chucking Grinder Co., P.O. Box 620, Springfield, Vt., or — **Circle No. A32.**

A SMALL LOT
METAL STAMPING SERVICE
AT LOWEST POSSIBLE DIE COST

BAR STOCK TO STAMPING

The cost was cut from $1.01 to $0.11 each on this flange by redesign to a stamping instead of machining from bar stock.

The performance of the die-stamped part was equivalent.

On 1100 pieces per year, the saving was $990.00, or — 89%

* * *

This briefly describes the cost of a typical part made for one of our thousands of customers.

We have a short run stamping service to offer, which is beyond comparison.

Factory trained representatives in all centers. • Write for full details.

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1551

CLOSE UP OF TYPE V-1 CADDY TOGGLE CLAMP

CADDY Toggle Clamps are used on the FORD Cleveland Foundry core wash operation in the manufacturing of FORD and MERCURY engine castings.

The FORD Foundry turns out castings for both FORD Engine Plants in Cleveland and high production equipment is essential.

Prior to the adoption of the CADDY Toggle Clamps, FORD tested the clamps for 6 months. The key feature in the selection of CADDY was that they maintained uniform clamping pressure throughout the life of the clamp and developed no springing or wobble.

CATALOG ON REQUEST

CADDY TOGGLE CLAMPS
Erico Products, Inc.
2070 E. 61st Place • Cleveland 3, Ohio
IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1552

THE year has been good to us—as we hope it has been to you—and in appreciation for all its blessings we pause from concerns of business to extend to our customers and friends the old but sincere double wish—

Merry Christmas
and
Happy New Year

THE WELDON TOOL COMPANY
3000 Woodhill Road • Cleveland 4, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1553

Expect More with a ROUSSELLE

More strength where it counts...
More accuracy where it's needed...
More simplicity where it helps...
...to turn out first rate work FAST with steady, dependable regularity

You'll like the economical run-of-job cost, the simpler maintenance, the easier set up and operation and the wider variety of work each one can handle. And YOU'LL LIKE THE PRICE when you compare Rousselle specifications and quality . . . Ask for condensed catalog.

Rousselle presses are sold exclusively through leading machinery dealers.

SERVICE MACHINE CO.
Mfrs. of Rousselle Presses
2310 West 78th Street - Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1561

WARDWELL "50 F" AUTOMATIC UNIVERSAL
Flute Grinder

SHARPENS AT LOWEST COST

Taps, Saws, Reamers, Woodruff Key Cutters, Milling Cutters.

Grinds straight flutes, spiral points, and sharpens saws in gang.

Takes saws from 1/2" to 8" diameter, in gangs up to 3 3/4" long — automatically indexes. Takes reamers down to 1/16" diameter.

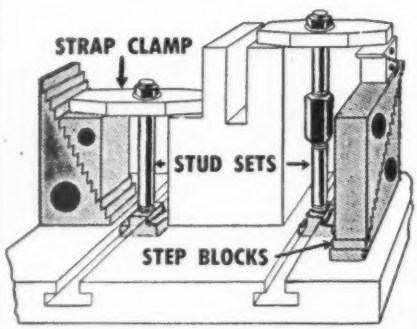
No special skill needed. Wardwell 50 F starts making money for you the very first day.

Please write for descriptive literature.

WARDWELL Manufacturing Co.
3809 Ridge Rd., Cleveland 9, Ohio

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1562



SURE-GRIP STEP BLOCKS

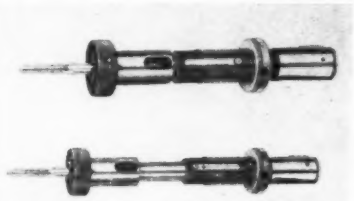
Clamping tools of all types.

Write for free tracing templates

TIETZMANN TOOL CORP.
Box 277
North Main St., Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1563

Eliminate Lead Screws on many tapping operations with new compression and tension tap holders for multiple spindle machines. The "JT" line of lock and eject collet-type holders compensates for variations

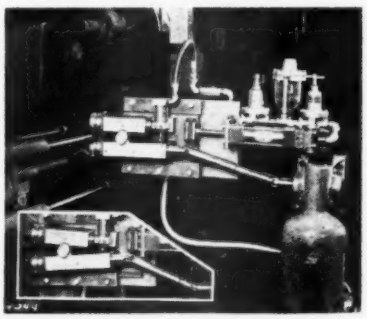


between the speed of the spindle and the lead of the tap. All parts are made accurately so that taps run true within 0.002". Scully-Jones and Co., 1901 S. Rockwell, Chicago 8, or — **Circle Inform-A-Gram No. A33.**

A New Paste Form of "Nicrobraz" stainless steel brazing alloy is now available. It can be used in brazing applications involving steels, nickel- and cobalt-base alloys, low alloy and carbon steels, and copper. This brazing alloy is heat and corrosion

resistant. It may be diluted with water to any desired consistency without rapid separation of metal and liquid. Stainless Steel Processing Div'n, Wall Colmonoy Corp., 19345 John R St., Detroit 3, or — **Circle Inform-A-Gram No. A34.**

Reload a Multiple Spindle Screw Machine without stopping the machine each time the previously fed stock is used up, with a "Rol-O-Matic" stock feeder. The need for feed



fingers and tubes is eliminated. The insert shows the stock feeder disengaged from the stock. Roll-O-Matic Industries, 18533 Weaver, Detroit 28, or — **Circle Inform-A-Gram No. A35.**

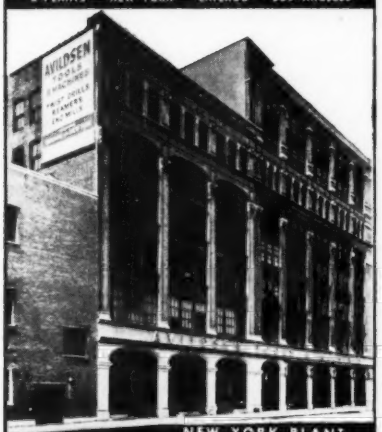
REPUBLIC

TWIST DRILLS — REAMERS

Whether it is for No. 40 holes in Titanium sheets for Jets or 1 3/16" holes in thick armor plate, Republic Drills give more holes per drill and more holes per hour of direct labor.

REPUBLIC DRILL & TOOL CO.
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.
MAKERS OF "CELFOR," "CENTURY," "REPUBLIC" AND "U.S. EAGLE" BRAND TOOLS

3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES



NEW YORK PLANT
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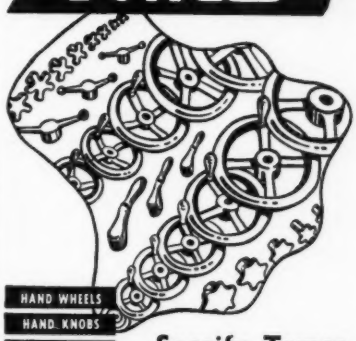
CIRCLE INFORM-A-GRAM KEY NO. 1571

Tomco



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HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

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Blank or Machined—from stock

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STOP SCALE AND DECARBURIZATION THE EASY WAY!!

3 BIG ADVANTAGES PROVE

PHOENIX BRAND
TRADE MARK REG. U.S. PAT. OFF.

NON-SCALING COMPOUND

THE PERFECT METHOD FOR HEAT TREATING TOOL STEELS AND ALLOY STEELS UP TO 1650°F!

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Simply coat piece to be treated — then harden or anneal as usual. It's that quick! This dry, easy-to-handle powder is applied in a jiffy — saves hours of costly finishing.

IMPROVES RESULTS!

Each finished piece is a shining example of production excellence. Phoenix Brand Non-Scaling Compound seals air out — assures *bright, pitless, scale-free* surfaces every time. Protective coating is removed in a flash — if necessary, just boil in plain water.

SAVES MONEY!

Polishing and grinding are virtually eliminated! Rejects are reduced! Furnace capacity and production increase — there's no cumbersome packs to crowd furnace.

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25 Lbs. or more.. $ 2.50 per Lb.

Available from your local distributor or

THE PARKER STAMP WORKS, Inc.
Established 1871
HARTFORD, CONNECTICUT

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The Genuine MAUSER **VERNIER CALIPER**

IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
- SPECIALLY LONG VERNIER to read thousandths
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back

$14.75 PPD

Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Stands.

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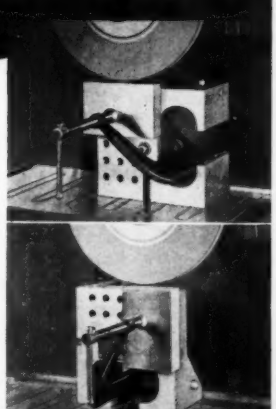
NEW Federal Square Master ANGLE PLATE

Will Grind A Work Piece Square The Easy Way Without Skilled Help

Designed for grinding a work piece to exact squareness, whether it be a component of a jig, fixture, gauge, or die; eliminating an indicator, precision square, surface plate, and use of top skilled help on routine jobs. Can also be used on layout work and inspection. This precision tool is built of high grade steel, stabilized, hardened and ground. ALL WORKING SURFACES ARE GUARANTEED TO BE SQUARE within two-tenths of a thousandth . . . (.0002). Write for complete literature describing other outstanding features.

Note adjustable set edge and recess for C-clamp. ➔



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Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM, WISCONSIN

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Over 85% of the torque wrenches used in industry are

STURTEVANT

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Read by Sight, Sound or Feel.

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- Automatic Release
- All Capacities

in inch grams...inch ounces...inch pounds ...foot pounds (All sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO. ADDISON [QUALITY] ILLINOIS

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"IMPERATOR"

PARALLELS and "V" BLOCKS

The Jewel of Magnetic Accessories

Pat. Pend.

PARALLELS

CODE	SIZE	MATCHED PAIR*
IP2	1x2x2	$16.50
IP3	1x2x3	19.50
IP4	1x2x4	22.50

"V" BLOCKS

CODE	SIZE	MATCHED PAIR*
IV2	1¾x2½x2	$22.50
IV3	1¾x2½x3	33.75
IV4	1¾x2½x4	45.00

*Includes hardwood box

Also available for Hanchett Magna-Lock Chucks at slightly higher price.

NOW AVAILABLE IN SETS!

SET No. 1
1 pr. Matched IP4 ..... $22.50
1 pr. Matched IV2 ..... 22.50
COMPLETE with plywood box **$41.60**

SET No. 2
1 pr. Matched IP3 ..... $19.50
1 pr. Matched IV3 ..... 33.75
COMPLETE with plywood box **$49.00**

SET No. 3
1 pr. Matched IP4 ..... $22.50
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COMPLETE with hardwood box **$61.60**

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CAMS ALL TYPES MADE TO YOUR SPECS

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has been done with the SCLEROSCOPE Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.

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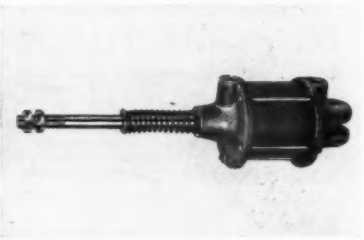
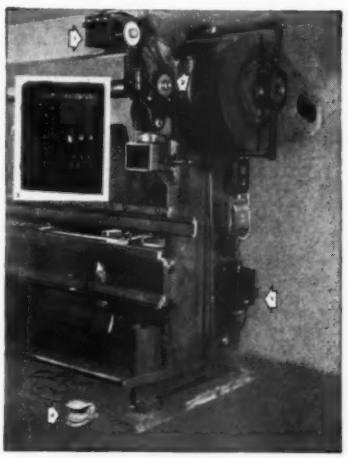
A Pull-Type Air Cylinder provides powered effort toward the cylinder and spring return. It has a standard length stroke of 1½", but longer stroke cylinders are available. Designed for clevis mounting, the



cylinder is used in "off-line" applications or where movement in an arc is required. Air-Mite Devices, Inc., 4417 W. Carroll Ave., Chicago, or — **Circle Inform-A-Gram No. A36.**

An Extruded Aluminum Way Cover protects machine tool ways against damage or clogging by chips or grit. Its sturdy construction permits the operator to walk on the cover while the machine is operating or idle. The "Way-Life" cover is designed for boring mills, planers, large grinders and vertical machines. Futurmill, Inc., 6360 Highland Rd., Pontiac, Mich., or — **Circle No. A37.**

Automatically Slow the Movement of the Ram during the bending stage with an automatic press brake control. The "Pulse of Slip" eliminates kinking or whipping of even the



largest sheets. It features preset stop, self return, and non-repeat, and is applicable to any press brake. American Actuator Corp., 219 E. 44th St., New York 17, or — **Circle Inform-A-Gram No. A38.**

A Miniature Bench Center checks the cone angle. It holds the machined part within 0.0005" parallel to angle. This bench center holds workpieces to 5⅜" long and 3¼" dia. Transicoil Corp., Worcester, Pa., or — **Inform-A-Gram No. A39.**

When New Molds Stick use IMS SILICONE FLUID

For Better Tool and Die Lubrication!

Shorten costly break-in periods! Simply spray on this perfect parting agent from self-dispensing aerosol! Useful too in PATTERN MAKING — releases patterns from master molds with minimum surface defects. Remember . . .

WHERE ANYTHING STICKS
it always pays to try
IMS SILICONE SPRAY

Get new tools into production sooner. Keep a few cans handy all the time. Order today!

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Single Can $2.00
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Part illustrated is actual size

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Speedtooling is an advancement and improvement used for manufacturing stampings in small quantities. It eliminates most of the cost required for permanent dies. Finished parts are produced to tolerances as close as those found in tools costing ten times as much . . . yet are very inexpensive. Speedtooling is stored for your future use and maintained at peak operating condition. Use WLS Stampings for production quantities up to 100,000 parts per year when low cost, fast delivery, possible design changes for virtually nothing are important factors!

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FAST delivery

- Blanking
- Forming
- Piercing
- Plating
- Machining
- Drawing
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- Extruding
- Stenciling
- Tapping
- Grinding
- Welding
- Counter-sinking

FREE
1. Write now for a free sample part with a cost summary.
2. Our free bulletin also illustrates 40 small stampings.
3. Send in your blueprints to our engineering department for a prompt quotation.

*Actual cost of illustrated part produced for one of our hundreds of enthusiastic customers:
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Labor ..... .029
Material .... .0086

WLS STAMPING COMPANY
3283 E. 80th STREET • CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1592

FOR
DRILLING
CORE DRILLING
ROUGH
AND
FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear —Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

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Telephone PLYMOUTH 1472

CIRCLE INFORM-A-GRAM KEY NO. 1593

You, Like Thousands of Others, Can Cut Die Making Costs

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Dependable and proved are OLIVER Die Makers. They reduce costs as much as 60% because they simplify sawing, filing and lapping operations. The Oliver Method saves time and does not require expensive hard-to-get skilled labor. These efficient, speedy and accurate machines have proved themselves in more than 10,000 installations throughout the world. In many plants these durable OLIVERS have been in constant use for over 25 years.

For nearly 40 years OLIVER DIE MAKING MACHINES have been found invaluable on such jobs as Production Filing, Experimental Work, Metal Patterns, Cams, Gages, Templates, etc. Improve your toolroom efficiency . . . For *better* dies—saw and file with OLIVER DIE MAKING MACHINES.

BE WISE OLIVERIZE

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

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Write Today For Complete Technical Data on OLIVER DIE MAKERS

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MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
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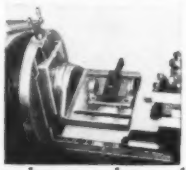
SLASH TOOLING COST, TIME FOR ANY MACHINING JOB



WE'LL PROVE IT WITH A FREE DEMONSTRATION!

Now . . . a low-cost universal work holding fixture for use on lathes and most other machine tools! Attachments shown below hold any round or irregularly shaped part, position it fast and accurately for any operation. Users report big savings! Accurate to .001".

Write for free demonstration or Bulletin No. 113

MICRO-CHUCK
Division, SCOTT-BROWNE CORP.
Batavia Pike • Newtown, Ohio

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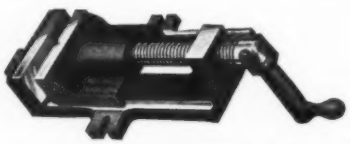

YOST DRILL PRESS VISE

• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
124 Grant St.
Cambridge Springs, Pa.

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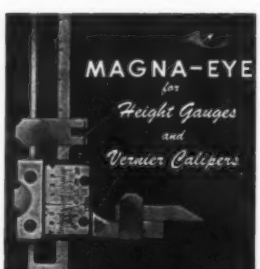


MAGNIFIES "Hard-to-Read" Vernier Scales on Height Gages and Calipers

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.

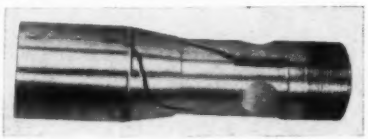
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" and 60" Calipers.

For Complete Information Write, Phone or Wire

STEBAR COMPANY
217 28th Ave. Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1604

A One-Piece Mandrel which operates as a reversed collet is the Westberg collet mandrel. It incorporates three stiff "fingers" which are twisted half a turn between the taper and the mandrel position,

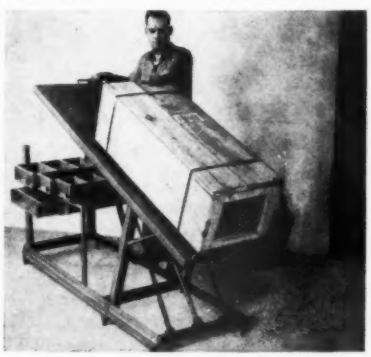


causing a reversal of the gripping action. The expanding mandrel will grip in a hole as small as 3/16". Erickson Tool Co., E. 23rd and Hamilton Ave., Cleveland 14, or — **Circle Inform-A-Gram No. A40.**

A Perforating Range from 0.093" to 1.500" is a feature of a new line of unitized perforating units. Series A units have a maximum capacity of ¼" mild steel and are available in 1" to 2½" stock holder widths. They have a two-piece punch and

small button die. A setup of "Unitized" tooling can be reused in other combinations for punching flat or flanged metal. Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y., or — **Circle No. A41.**

A Hydraulically Controlled Packing Bench can be tilted to set boxes weighing up to 1000 lbs on the floor after they have been packed. The "Hydra-Tilt" table eliminates the



possibility of injury when moving heavy boxes off the packing bench. It is produced by Valley Craft Products, Inc., 770 Jefferson Ave., Lake City, Minn. **Circle No. A42.**

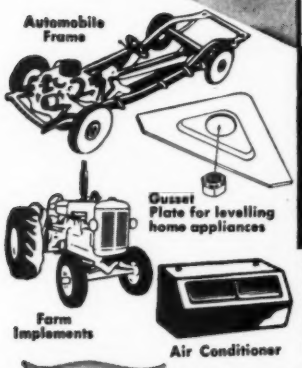
WHEN YOU NEED *Quicker Fastening*

FOR

- Blind Assemblies or
- Extra Threaded Depth at less cost...

use one of these 2 WELD NUTS

Gripco Pilot-Projection Weld Nut. Circular pilot designed for quick, easy positioning of nut over bolt hole for instant resistant welding. No jigs, no fumbling, no waste of time. Furnished with or without famous Gripco locking feature.



Gripco Countersunk Weld Nut. Eliminate time-wasting retapping of nuts after welding. Exclusive countersunk nut bottom does away with fouling of nut threads by weld spatter. Available with or without Gripco locking feature.

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GRIP NUT COMPANY

308 W S. Michigan Ave. - Chicago 4, Ill.

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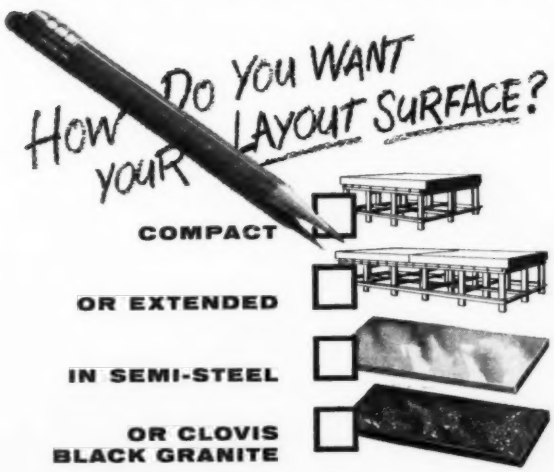

CHALLENGE LAYOUT SURFACE PLATES MEET EVERY REQUIREMENT

Available with grooving, scoring, or "T-Slots". In a complete range of standard sizes. Other sizes to order.

You name it . . . Challenge has it! A complete line of Layout Surface Plates in single plate units or multiple sections grooved and keyed into one large flat surface . . . made of special analysis semi-steel or new Clovis Black Granite. Whatever your preference, Challenge Layout Surface Plates provide the unyielding strength and accuracy you need for precision engineering.

Write for the new Challenge Catalog.

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Challenge

THE CHALLENGE MACHINERY CO.

Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1612

HIGHER SPEEDS/ FASTER GRINDING/

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AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

kipp

MADISON-KIPP CORP.

212 Waubesa St. • Madison 10, Wis., U.S.A.

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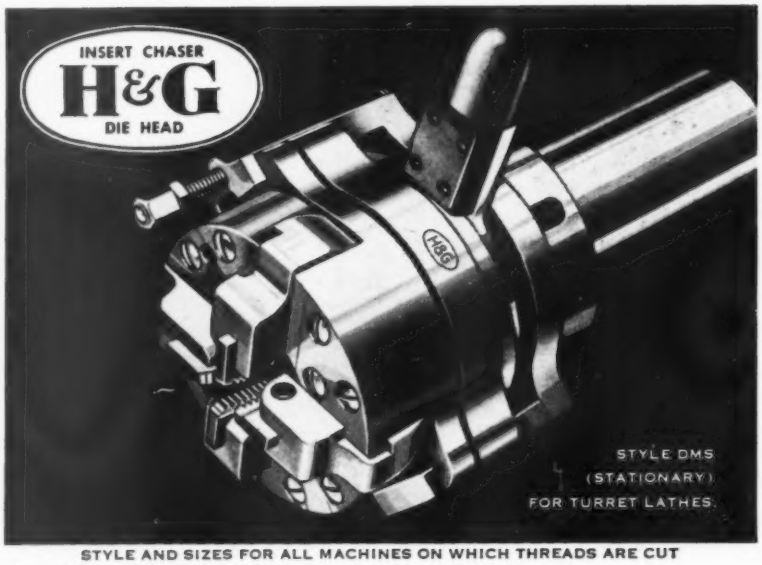


STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

THERE IS NO OTHER LIKE IT

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for less than $40 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "Unified and American Screw Thread Digest" sent free on request.

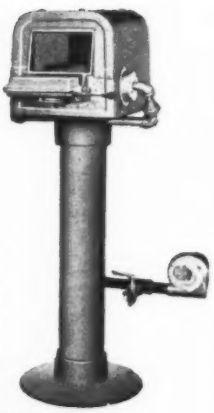
THE EASTERN MACHINE SCREW CORPORATION 29-49 Barclay St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1621

SPEED PRODUCTION

ELIMINATE DELAYS with
Quick Acting JOHNSON Furnaces

Heat treat high speed steels
Harden high carbon steels
Braze carbide tipped tools



JOHNSON No. 120 Hi-Speed

Heat treat tools, dies and small metal parts in your own plant. Quick Acting JOHNSON No. 120 Hi-speed delivers 1500° F. in 5 minutes, reaches 2300° F. in 30 minutes. Gets the job done fast to save time and gas. Temperatures easily regulated with accuracy. Firebox 5 x 7¾ x 13½. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

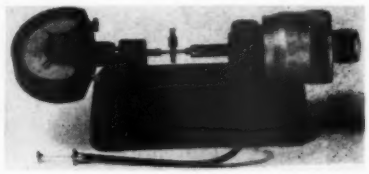
No. 120 Pedestal Style—$167.00 F. O. B. Factory

There is a Quick Acting JOHNSON Unit for every toolroom and shop. Write for complete catalog. Johnson Gas Appliance Company, 575 E Avenue, N.W., Cedar Rapids, Iowa.

JOHNSON Since 1901
FURNACES FOR INDUSTRY

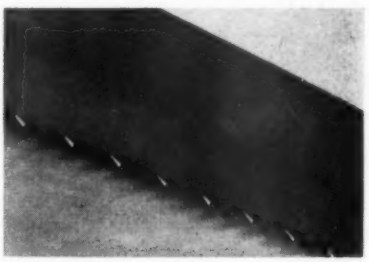
CIRCLE INFORM-A-GRAM KEY NO. 1622

A Bench Micrometer with a dial indicator featuring a non-rotating spindle measures by 0.0001" directly from the micrometer thimble. It's used for fine, small-parts measurements such as required on instru-



ments, parts, wires, screw machine parts, etc. As a comparator, it can be set without additional standards. George Scherr Co., Inc., 200 Lafayette St., New York 12, or — **Circle Inform-A-Gram No. A43.**

A Power Hacksaw Blade with chamfered teeth improves hacksaw metal-cutting. Many second or milling operations are eliminated by using Athens "Chamfer-Tooth" blade.



This patented blade features longer life, less breakage, and smoother, straighter cuts. Athens Saw Div'n, Borg-Warner Corp., Indianapolis 9, Ind., or — **Inform-A-Gram No. A44.**

Versatility, High Productivity, and extreme accuracy are features of a precision boring machine. Style 2112-B machine is a smaller single-end model that accommodates small and medium size workpieces. A newly designed hydraulic control panel provides a wide variety of

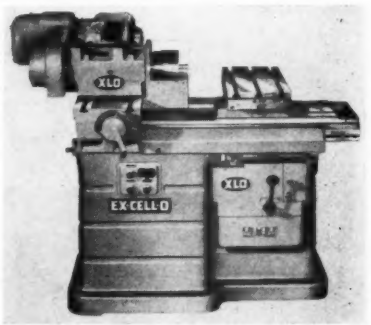


table feeds and speeds. Although ideal for the tool room, this machine can be set up for production work with the controls locked for continuous reproduction to close limits. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **Circle No. A45.**

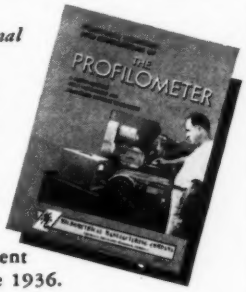
In Production and Inspection

THE PROFILOMETER®

can help you

SAVE BIG MONEY!

- Gives a *quick, positive check* of surface roughness, *at the machine.* Lets you tell *for sure* whether parts are to specification. *Helps avoid over-finishing.*
- Permits *closer SIZE control,* all along the line.
- Helps you find and eliminate *unnecessary operations* (you may be surprised!).
- Shows impending *dimensional* errors *before they occur!*



FREE BULLETIN LT89 gives details on these and other money-saving uses. Also describes operating features. Write for it — today!

THE PROFILOMETER — leader in roughness measurement throughout the world . . . since 1936.

Profilometer is a registered trade mark.

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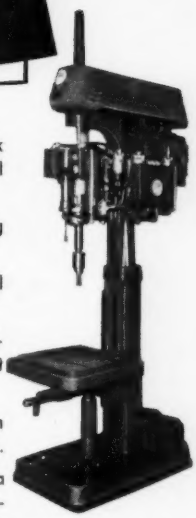
SETS NEW PRODUCTION RECORDS!

BECKETT *Air Thrust*

DRILLING AND TAPPING MACHINES



- You tap *direct* from drill chuck or any standard multiple drill head.
- No clutch, leadscrew or tapping head required.
- Duplicates the class thread ground into the tap.
- For drilling, thrust is easily adjusted to provide exact drill point pressure.
- Machine is quickly changed from drilling to tapping or allied work.
- Get full details. Find out how a manufacturer of precision aircraft parts reduced rejects due to tapping from 12% to less than ½ of 1% — and doubled tap life — with Beckett machines. The investment is low and deliveries are good. Write for Bulletin 50.

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For long or short production runs of large or small parts, tools, jigs or fixtures. Also dies, gages, special machinery.

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Also Milling Machines, Grinders, etc. Complete production facilities — experienced machinists.

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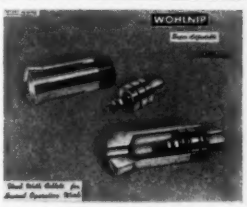

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Used with collets for second operation work. Assuring consistent accuracy, permanent set-up, producing identical results. No alterations to your collets are necessary. Fully adjustable. Available for any size collets. END GUESS WORK AND REJECTS—

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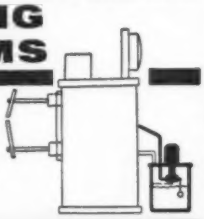
Saves Spot-Welder Tips —No waste water— Complete **$57.50**



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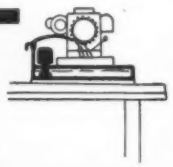

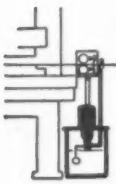

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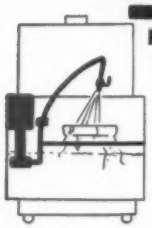
Graymills Stocklube System applies oil or compounds. Cleans stock. Coats top and bottom. Approx. **$188.00** complete



HERE'S A SAFER WAY TO CLEAN TOOLS, DIES and PARTS that are handled individually. Graymills AGITOR flushes parts clean, with filtered solvent. From **$59.75** to **$224.50**

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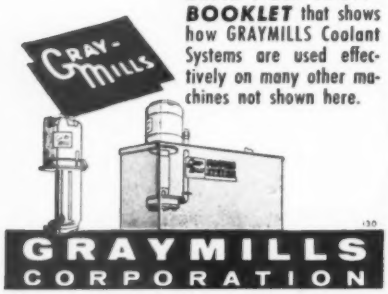

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Increase production hundreds to one over hand methods. Reduce labor costs. Eliminate need of experienced workmen.

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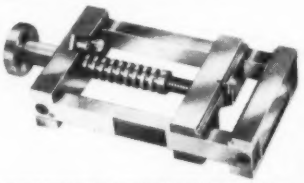

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Producto's Precision Toolroom Vise is essential equipment for your jig borers, surface grinders, drill presses, tappers. It's extremely strong, yet weighs only 13 lbs. and has a 2" high frame. Has large jaw opening, will clamp heavy as well as light workpieces. All surfaces hardened and ground. Works on five surfaces. Write for Bulletin TE2-103.

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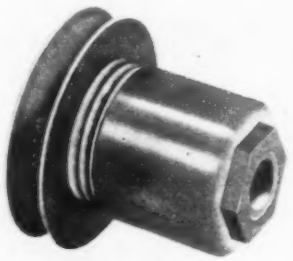
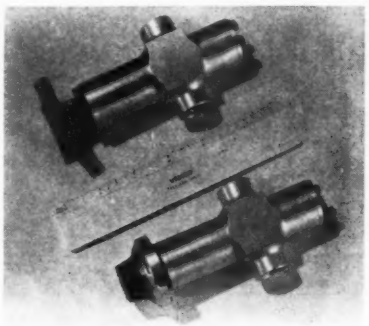
A ¼-Hp Variable Speed Pulley is designed for limited space applications. It can be mounted with the belt take-off close to the motor and/or reversed. E-1350 pulley de-



livers speed ratios up to 2 to 1. The maximum bore is ⅝" with keyway. Lovejoy Flexible Coupling Co., 4819 W. Lake St., Chicago 44, or — **Circle Inform-A-Gram No. A46.**

An Improved 14-Inch Band Saw features an 8-speed drive and an accessible clutch on the end of the lower wheel shaft. Rapid change-over without removing the v-belt is possible, except in changing from the lower four to the higher four speeds. The new drive is believed to offer the lowest speed in the metalworking industry to permit easy cutting of stainless steel, hard steels, and forgings. Rockwell Mfg. Co., Delta Power Tool Div'n, 443 N. Lexington Ave., Pittsburgh 8, or — **No. A47.**

A Metering Valve has been designed for metering or control service over a wide range of flow and for use in high pressure hydraulics. A multi-turn indicating dial handle



can be included for rapid setting. Ratio of maximum to minimum controllable flow can be provided up to 100,000:1. United Hydraulics, Inc., 110 Terrel Ct., Dayton 7, O., or — **Circle Inform-A-Gram No. A48.**

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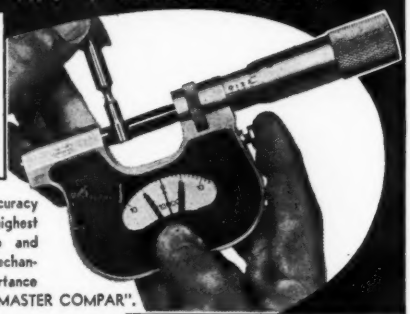
No Arguments as to correctness of reading due to "feel". Use it as Comparator, Master Micrometer, Go & No Go Gage. 1" Range reading in 1/10,000"



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Also Available in LARGER SIZES

A RIGHT HAND TOOL
Release button for movable Anvil on RIGHT Hand side enables you to hold tool the conventional way.

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Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Ovalness & Taper.

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KLIP-BILT®
STEEL SHELVING

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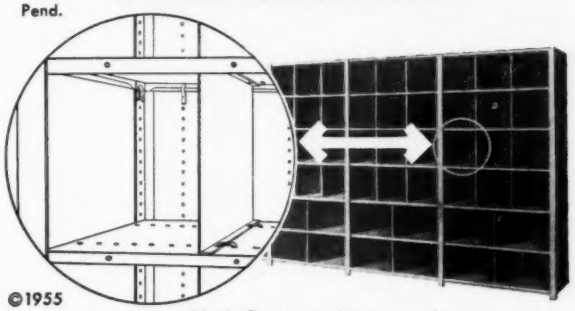

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All fastening is with simple clips . . . easily installed by hand yet ingeniously designed to hold shelves, panels, dividers, and T-posts of various thicknesses pressure tight. Clips can be quickly disengaged, too, to permit easy rearrangement or disassembly of shelves.

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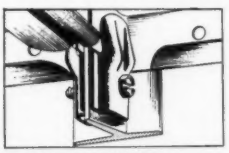

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Just three parts for quick installation. Hardened cadmium-plated threaded stud and two heavy steel clips, one having stamped thread. Holds shelf flange *tight* against tough, rail steel T-post to prevent shelf from sagging when heavily loaded.

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Secures back panels to shelf flanges. Engaged at each shelf level. Quickly installed from *in front* of shelving.

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Locks into two shelf holes to provide firm anchorage. Clips are flat, do not interfere with storage.

A SHELF FOR EVERY LOAD
A. For average loads
B. For heavy loads (Front and rear flanges reinforced.)
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TITAN Toggle Clamps!
(Models 557 and 558)
• THE ULTIMATE IN RUGGED CONSTRUCTION
• completely replaceable parts
• forged steel components
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• weight of 4½ pounds!
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OPEN POSITION
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WORLD'S FIRST LINE OF TOGGLE CLAMPS
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Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME
The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.
Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.
Write for Descriptive Bulletin
WHEEL FORMS
7226
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123 AVERY ST. • MT. CLEMENS, MICH.
CIRCLE INFORM-A-GRAM KEY NO. 1662

A Long-Bed Metalworking Lathe has been introduced by Rockwell Mfg. Co., Delta Power Tool Div'n, 443 N. Lexington Ave., Pittsburgh 8. Designed with a 5-ft bed that is about 12" longer than the standard model, it is for production or tool room use. This lathe has a unique drive selector, perfected variable speed drive, and massive spindle construction. **Inform-A-Gram No. A50.**

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centers, near shoulders, and hard-to-reach locations. In assembly, the driver and chuck run true within 0.002". Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or — **Circle Inform-A-Gram No. A51.**

"Triple Additive-Treatment" is a feature of a concentrated water soluble cutting coolant. "Hypercut XX" is fortified with a super lubricant-additive, an anti-foaming agent, and a bactericide. It performs with efficiency during grinding, turning, drilling, milling, reaming, etc. This coolant is especially recommended in the machining of high hardness alloys. Destiny Products Co., 2970 W. Grand Blvd., Detroit 2, or — **Circle Inform-A-Gram No. A52.**

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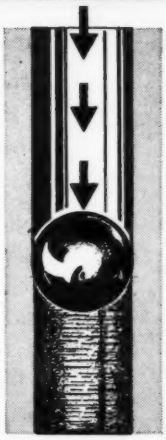
Weighing 4 oz., the clamp has a holding pressure of 150 lbs. Detroit Stamping Co., 350 Midland Ave., Detroit 3, or — **Circle No. A53.**

BALLIZING

For NEW Speed and Economy in Hole Sizing and Finishing



BALLIZING is a precision high-production process for sizing and finishing die-cast, drawn, and machined holes — simply by pressing a ball through the unfinished hole. With alloy steel and tungsten carbide balls available in practical quantities and in any size required, this process is used with holes of all diameters.

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FAST; takes only seconds. ACCURATE. FINE FINISH — burnished smooth. ECONOMICAL. Uses unskilled labor. No tool sharpening. No close adjustments. No special equipment.

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All Materials — All Sizes
In Large or Small Quantities

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Gage Company PRECISION PLASTIC
COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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GAGE COMPANY
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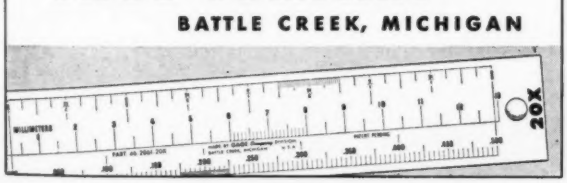

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FOR ANY PURPOSE

IN ANY SIZE

IN ANY QUANTITY

...from a package to a carload

Our maintaining such large stocks of all 4000 items means lower costs to you because no large inventories are needed, service is faster. Our better methods of manufacture produce a higher quality product. Good reasons why so many industrial users in the last 83 years have come to specify "Chicago" Screws.

Service-Conscious Industrial Supply Distributors EVERYWHERE carry complete stocks of "Chicago" Products. To speed delivery time, call the one nearest you.

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The CHICAGO SCREW COMPANY
ESTABLISHED 1872
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The complete Chicago "Safety Plus" line includes in alloy steel: Socket Set Screws • Socket Head Cap Screws • Socket Stripper Bolts • Square Head Dog Point Set Screws • Socket Pipe Plugs • Flat Head Socket Cap Screws • Dowel Pins • Hexagon Keys and Key Kits • Also Socket Set Screws and Socket Head Cap Screws in Stainless.

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Get our prices on salvaging your worn-out plug and ring gages.

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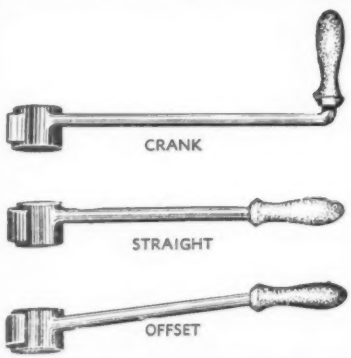
REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!



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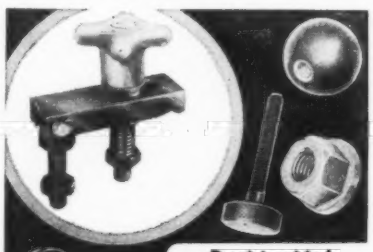
Straight Edges • Parallels

RAHN GRANITE SURFACE PLATE CO.
638 N. Western Ave., Dayton 7, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1683



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HARCO HARCO ENGINEERING
12092 Woodbine Detroit 39, Mich.
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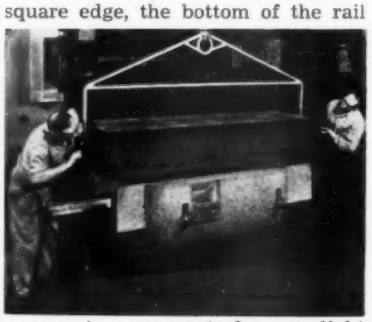
CIRCLE INFORM-A-GRAM KEY NO. 1684

Cheaper Small Parts Production is possible with a newly perfected fluid-feed rotary table. It holds and delivers small parts to drill, tap, swage, stake, etc. with an accuracy of 0.003". This device provides positive, uniform air-hydraulic indexing up to 2800 parts/hr. This table

gives smooth, even power for light or heavy weights. It combines with the "Meadmatic" timer, air hammer, air press, drill presses, etc. to make almost completely automatic machines. Mead Specialties Co., Dept. FFT-93, 4114 N. Knox Ave., Chicago 41, or — **Inform-A-Gram No. A54.**

A Double Action Hydraulic Press is available from Clifton Hydraulic Press Co., 284-292 Allwood Rd., Clifton, N. J. Model SF 300 is electrically controlled for automatic or semi-automatic operation. The press may be equipped with hydraulic cushions in the bed for metal drawing applications. It may be built to meet almost any speed, stroke, or platen size requirement and is available in capacities from 50 to 300 tons. **Circle Inform-A-Gram No. A55.**

Square Edge Black Granite Surface Plates have been developed by Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton 7. Shown is a 28" x 84" x 14" plate being used to spot the rails of a universal vertical grinder. The convex face of the plate will spot the back of the rails concave; and the concave square edge, the bottom of the rail



convex, to compensate for any slight deflection of the rail when the weight of the grinder head is added. The 28" x 84" surface has been precision lapped uniformly convex to a maximum tolerance of 0.0003" at the center. The two diagonals of the plate are the same within 0.0001". **Inform-A-Gram No. A56.**

free!

DON'T MISS FIELD REPORTS 18 & 24

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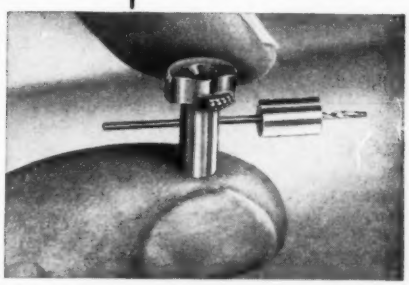
CIRCLE INFORM-A-GRAM KEY NO. 1691

*ULTRA PRECISION BUSHINGS . . .

For gauge assemblies, flow orifices, wire drawing dies, etc. Guaranteed accuracy to .0001 in bores up to 3/8" long.

★ With Micro Drill Guides



Special Holes are Standard!

No change in price or delivery for metric and special hole sizes in STANDARD MICRO DRILL GUIDE RANGE OF #80 to 3/32" in listed body sizes.

LONGER LIFE

No counter bore . . . diamond lapped hole with full length drill bearing.

Also Available

- Special Micro Drill Guides with body sizes other than those listed and hole sizes not in the standard #80 to 3/32" range.
- Job micro-drilling of your parts.
- Engineered MICRO-TOOLING, drills, jigs, collets, etc.

MICRO DRILL GUIDE
JEDCO
3980 SUPERIOR AVENUE CINCINNATI 24, OHIO

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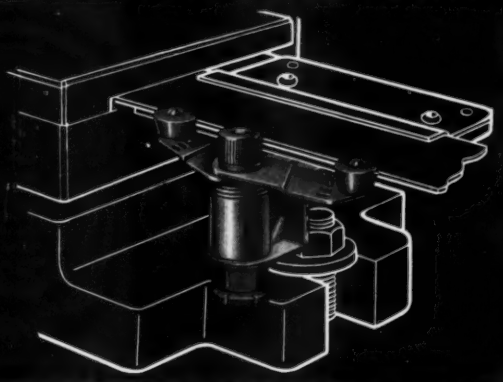
We Now Have Some Areas Available. Contact Us Immediately.

CIRCLE INFORM-A-GRAM KEY NO. 1692

NOW...
A Low-Cost Stock Guide



NEW DANLY ROLLER STOCK GUIDES AND GUIDE RAILS

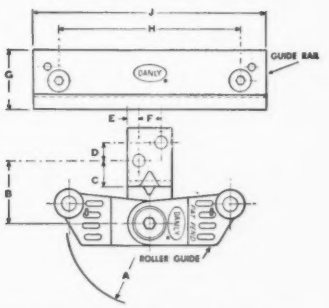
READY MADE—QUICK TO INSTALL

Versatile...for use on dies or in any operation where coil or strip stock must be guided.

Low-cost...the cost is only a fraction of the shop expense necessary to tailormake a guide.

Rugged...constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

Roller Guide, Large.....$4.50 each
Roller Guide, Small.....4.00 each
Guide Rail.....$3.50 box of five (all one size)
(Discount for quantity orders)



Roller Guide Dimensions, Inches

	Cat. No.	A	B	C	D	E	F
Roller Guide Large	9-70-6	2 3/64	1 15/32	5/8	1/4	5/16	7/16
Roller Guide Small	9-60-6	1 27/64	1 1/16	7/16	5/16	3/16	3/8

Danly Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.

Guide Rail Dimensions, Inches

	Cat. No.	Max. Stock Thickness	G	H	J
Guide Rail	9-8025-6	.025	1	3 1/8	4
	9-8045-6	.045	1	3 1/8	4
	9-8080-6	.080	1	3 1/8	4
	9-8125-6	.125	1	3 1/8	4

Danly Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.

For immediate delivery, specify catalog number and mail orders to

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1693

Now! Drill deep holes thout costly "Specials"!

ACE 2" LONGBOY DRILLS

you've been investing a lot of money "specials" for deep hole drilling erations, then here's good news for u! Ace Drill Distributors now carry, *standard stock*, a complete line of " Longboy drills . . . ready for mediate delivery! And, in many inances, you'll find that an Ace Longy can be a big *improvement* over a stly "special"! The polished flutes are ecision ground into a properly hardened gh speed steel bar. This makes possible finer finish and keener cutting lips. nd the result? Greater production, longer ol life, lower operating costs. Call your cal distributor . . . or send for complete formation today!

CE DRILL CORPORATION
drian, Michigan

entlemen: Please send me your Catalog No. 52-C ntaining complete information on ACE "Ground-from-Solid" Drills and hardened H.S.S. drill blanks.

AME_____

OMPANY_____

DDRESS_____

TY_____STATE_____

ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1701

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C 1A, 4C 5C

480 (AC-50)

All collets in hexagon, square and round.

KLUTCH-KOLLET

Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.

Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

HAND DRAWBAR ½" cap.

LIVE CENTER (Ball Bearing) Double sealed for accuracy.

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KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

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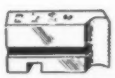
Integrity Since 1919

CIRCLE INFORM-A-GRAM KEY NO. 1702

ONE SOURCE -

Assures uniformity and precision between taps and chasers from country's largest independent manufacturer of die heads, chasers (milled, ground thread or tapped form) solid and solid adjustable taps. All tangent type chaser threads ground from solid. Write for catalog.



PROMPT DELIVERY

Save 10-20% on special solid taps

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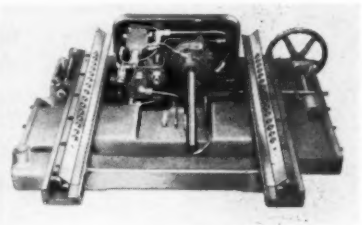
P. O. Box 268 at Akers
North Branch, Michigan

Representatives in principal cities

CIRCLE INFORM-A-GRAM KEY NO. 1703

SURFACE GRINDER FEED FEATURES BALL BEARING WAYS

All surface grinders in the Hydrabrasive line are now equipped with a new precision cross feed screw and ball bearing saddle ways for smooth, precise saddle transverse adjustment. Hydrabrasives are now even more ideal for accurate slot grinding, and with the hydraulic drive feature, quick acting, vibrationless operation is provided to table feed and saddle feed screw.



Ball bearings roll in square, rather than V channels, as shown in the illustration, which completely eliminates table rocking and excessive wear. The pre-loaded bearings are packed in grease for lifetime lubrication. With this new design, the centerline of work on the chuck never out-travels the full support of the saddle ways. This feature keeps work directly between saddle ways, thus eliminating overhang.

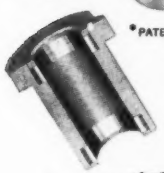
The saddle feed screw is precision ground and has a backlash take-up nut. Hydraulic power plus ball bearing saddle ways assure smoothness of operation for grinding to extremely close tolerances.

Hydrabrasive grinders equipped with the new saddle cross feed screw and ball bearing ways are the No. 824, No. 1218 and No. 1224, built by the Abrasive Machine Tool Company, East Providence, Rhode Island.

JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
14 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1704

INCREASE PRODUCTION.. SAVE TIME & MONEY ON YOUR DRILLING OPERATIONS



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MEYCO

Carbide Inserted Bushings last longer, cost less in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

☆

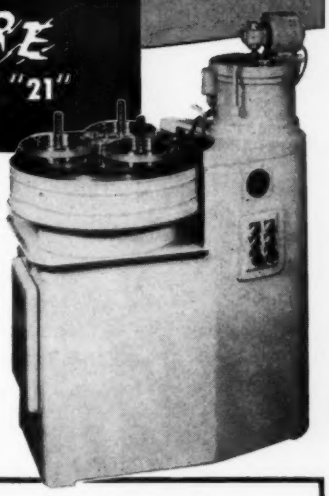
Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 41

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1711

NEW! Push-Button micro-precision flat lapping SPITFIRE GYRO-MATIC "21" Lapping Machine



- *Automatic! Easy Push-Button operation!*
- *Super Precise! Produces optical flatness to .0000116!*
- *Economical! Saves time, work, labor flat lapping any material!*

The new Gyro-Matic "21" means any firm . . . your firm . . . can now have finest finishing on any material! Cost is so low . . . performance so perfect . . . revolutionary advanced features so important—the Gyro-Matic "21" stands out as the most significant step forward in flat lapping in years!

18" and 24" flat lapping machines also available.

SPITFIRE ROLLER LAPPING MACHINES

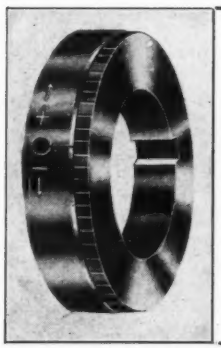
Both upright and bench type models specially designed for micro-finishing cylinders, plug gages, shoulder parts, etc. in ⅓ the time!

Simulates figure 8 motion of hand lapping	*Simple-to-operate*	*Economically provides highest level quality control*

Write for complete detailed information *today!*

SPITFIRE Tool Co.
2937 N. Pulaski Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1713



MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
⅞	1-9/16	$11.50
1	1-13/16	11.50
1¼	2-1/16	12.25
1½	2-7/16	12.25
1¾	2-3/4	14.50
2	3-1/16	16.50

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7 B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1712

Horberg PIN GAGES *drill sizes taper entry*

Unlimited time and cost saving advantage in set-up, production, final inspection, wherever holes or slots must be accurately gaged, determined and located.

- **Accurate to —.0001" —.0000"**
- **Concentric taper on lower half .001" smaller than gage size.**
- **Oil hardened tool steel — standard 1½" length.**

PAIRED SETS IN CONVENIENT, INDEXED PLASTIC CASE

Letter sets — 52 gages, A-Z in pairs
Fraction sets — 60 gages, 3/64" to ½" in steps of 1/64" in pairs.
Number sets — 120 gages, 1 to 60 in pairs
Individual gages in stock — extra stands available
All items stocked for immediate delivery

THE *Horberg* GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

QUANTITY
____Letter Sets @ $ 60.
____Fraction Sets @ $ 66.
____Number Sets @ $120.
____Single gages @ $150.
____Case alone @ $ 15.

Please rush checked items and literature to:
COMPANY _____
ADDRESS _____
NAME _____
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CIRCLE INFORM-A-GRAM KEY NO. 1714

Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Major Vulcan Services

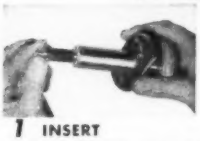
Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.

741 LORAIN AVE., DAYTON 10, OHIO

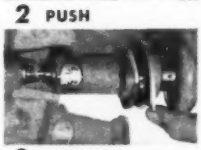
CIRCLE INFORM-A-GRAM KEY NO. 1721

Wait! Don't Throw Out Those WORN DRILLS!



1 INSERT

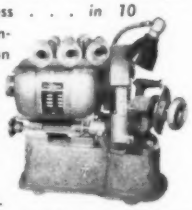
2 PUSH



3 TWIST

4 GRIND

The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness ... *in 10 seconds!* Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once ... web-thinning equally simple! Pays for itself many times over!



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BLACK DIAMOND

SAW & MACHINE WORKS

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IT TAKES LESS TIME TO MICRO-FINISH HARD MATERIALS WITH

ELGIN DIAMOND

Color Identified for Positive Use
Grades for Every Purpose
Use Any Standard Finishing, Polishing or Lapping Technique
Finish with diamond... Elgin Diamond!
Ready to Use, No Mixing

This booklet will help you Write for your free copy now!

See pictures of Elgin diamond in application ... gives details of method, grades to use and time required. Write today!

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

Dept. D

ELGIN, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1723

End Welded Studs Withstand Extreme Shock and Shear

End welded studs, after five years of proved dependability while meeting punishing demands of extreme shock and shear in thousands of Nash and Hudson Ramblers, will be playing increasingly vital roles in the running gear assembly of 1956 cars made by American Motors Corp., Kenosha, Wisc.

Every time the rear wheel of a Rambler hits a bump, a special ¾" dia Nelson shoulder stud, serving as the anchor pin for the shock absorber at the axle end, is subjected to a severe shearing force. The stud is a horizontal extension of the shock absorber plate, which holds the leaf spring to the axle by means of two U-bolts placed over the axle.

This particular use of Nelson studs, the first of its kind in the automotive field, was first tested in early 1950. Its purpose was to improve design and speed assembly of Ramblers.

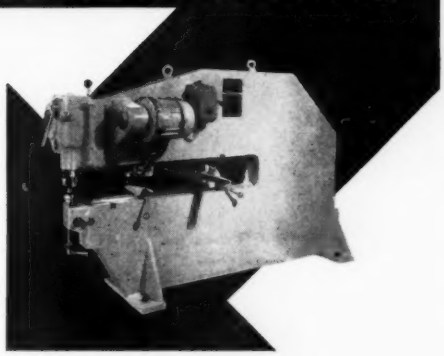
Fig. 1. The special ¾" Nelson shoulder stud is being end welded to a shock absorber plate of a Nash and Hudson Rambler. The plate is placed in a fixture and secured with a quick-acting clamp. When the start button is pushed, the gun automatically moves into position, welds the stud and retracts.

Fig. 2. After the stud is welded, a large washer is pressed on the tapered part of the stud and against the shoulder (right). The washer provides a bearing for the shock absorber which slips over the stud.

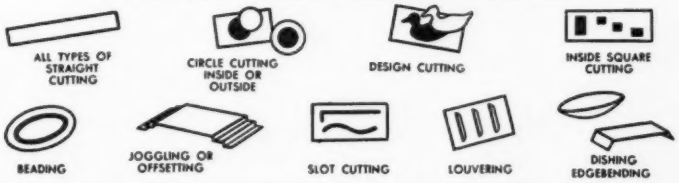
YOU'LL BE AMAZED at what PULLMAX DOES in metalworking

1 machine can do all these jobs in your shop

Ask any Pullmax user and he'll usually say, "I don't know how we ever got along without it." 7 sizes of Pullmax cut mild steel up to 1½". Pullmax does all the jobs shown here and generally pays for itself in three or four months by saving time, labor and material.



PULLMAX DOES ALL THIS WORK



COMPLETE NATIONAL SALES AND SERVICE
WRITE FOR THE PULLMAX CATALOG OF MONEY-SAVING METALWORKING IDEAS

AMERICAN PULLMAX COMPANY, INC.
2469 North Sheffield Avenue • Chicago 14, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1731

Socket Slotted

SET SCREW Application 7 Times Faster, New SETKO HOPPER-FED Way

One plant's production rate zoomed from 300 per hour to 2,000 per hour after installing Setko Hopper-Fed Special Equipment* which adapts readily to present machines. Others are making similar gains and getting many additional advantages such as great reduction in cross-threading and floor loss; adaptability to all metals or plastics and smaller set screw inventory.

Arrange for demonstration at our plant, without cost or obligation to you.

Fill in coupon and mail today.

*Pat. No. 2,638,945 Other Patents Pending

Set Screw & Mfg. Co.
158 Main St., Bartlett, Ill. (Chicago Suburb)
1160R

We Specialize in Solving Puzzling Set Screw Problems

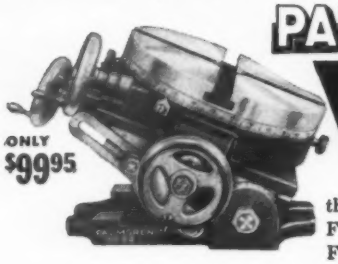
COUPON

SET SCREW & MFG. CO., 158 Main Street, Bartlett, Illinois
I would like to have free demonstration of Hopper-Fed Set Screw mechanism at your plant.
Please advise particulars.

INDIV. NAME.....
COMPANY.....
ADDRESS.....
CITY..... ZONE... STATE.....

CIRCLE INFORM-A-GRAM KEY NO. 1732

SPEED UP PRODUCTION...SAVE TIME and MONEY with this new PALMGREN Rotary, Index Milling Table



PATENT APPLIED FOR

that combines Rotary Feed and Two Cross Feeds in one unit, Plus a 90° Angle Tilting feature.

Here is a table that can be used as an angle plate as well as for laying out work. It's a compact, versatile table for accurate performance in any shop, for hundreds of time-saving jobs on drill presses or milling machines. Quickly adjustable to any angle up to 90°. This new No. 84 Tilting, Indexing and Rotary Table has an 8" diameter top graduated for the full 360°. Center is bored for 1½" locating plug. Rotary Feed dial is 1½" diameter and graduated in 3 minute graduations. Cross Feed dials are 1" and graduated in thousandths. Indexing attachment is easily and quickly attached to rotary hand wheel shaft. Base width 5", length 9¾". Feed is positive with a gear ratio of 40-1.

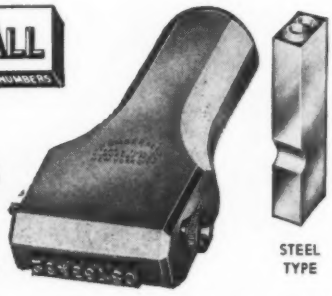
64 different models and types of vises, rotary tables, milling attachments, and other machine tool accessories. Write for Catalog No. 203.

CHICAGO TOOL AND ENGINEERING CO.
8388 South Chicago Ave. • Chicago 17, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1741

NUMBERALL
CUTS THE COST OF STAMPING NUMBERS

IMPROVED TYPE HOLDERS for stamping into Metal, etc.



Hand or Press Style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters. Write for Bulletin TP23H.

DETAIL CHASE and PUNCH
FOR QUICK STAMPING OF NAMEPLATES

Model 24

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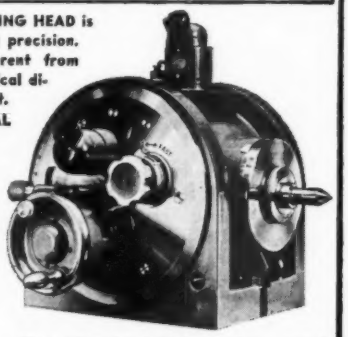

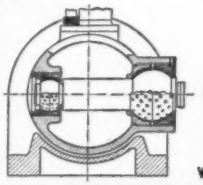

The 2 spherical ends of the spindle are carried in hardened steel cups with several hundred small precision balls held in place by ball cages in such a way that each ball creates its own path. There is no play, either radially or axially, no oil film, no wear and a very large load capacity.

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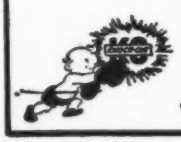

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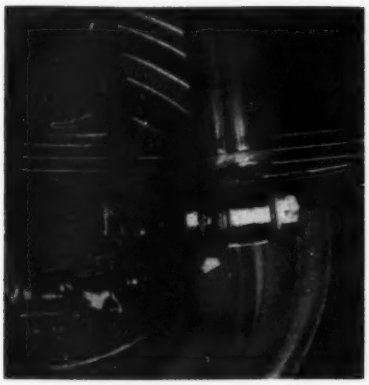

Fig. 3. Every time a rear wheel of a Nash or Hudson Rambler hits a bump, a special ¾" Nelson shoulder stud, serving as the anchor pin for the shock absorber (arrow), is subjected to severe shearing force.

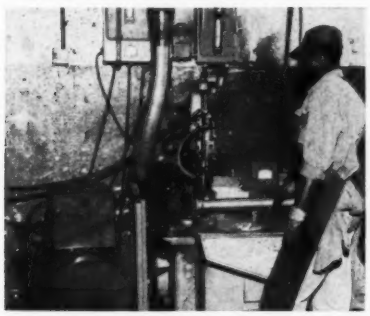

Fig. 4. Rear axle tubes have two end welded studs in vital fastening jobs. The shoulder stud being end welded here becomes a truss rod anchor. In this operation, the tube is placed in two V-blocks and against a spring-loaded pad that locates it radially. After the operator activates a foot switch, an air cylinder automatically clamps the tube in place against a stop at the flange end. The gun automatically moves into position, welds the stud, and retracts.

The application proved so successful, with 100% dependability of the studs, that American Motors engineers have redesigned the running gear assembly of all their cars to incorporate two other key functions for Nelson studs. First used last year in Nash Ambassadors and Statesmen and Hudsons, these latest features have been extended to the 1956 Ramblers.

Two standard Nelson ¾" shoulder studs are end welded to the rear axle tube. One stud becomes a truss rod anchor, while the other holds a bracket which secures the sway bar. On the opposite end of the axle, only the truss rod stud is used, while the sway bar is there attached to the car body.

Before the redesign using studs, the truss rod was fastened with a forging that was hand welded to the axle tube. The forging had to be faced off, drilled and tapped, and approximately 4" of hand weld was required. A bolt was then passed

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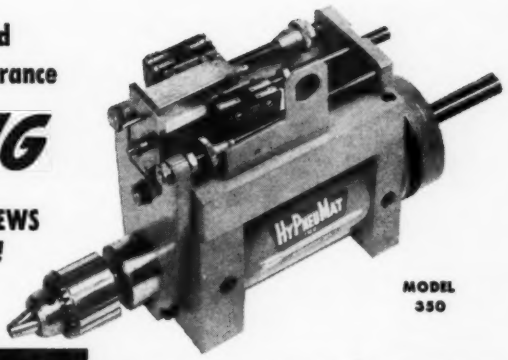

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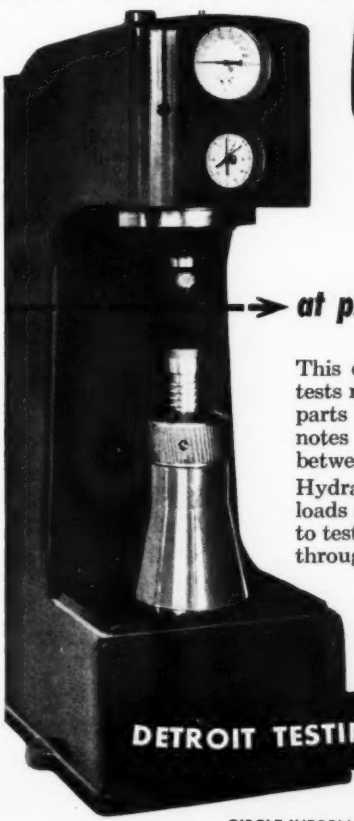

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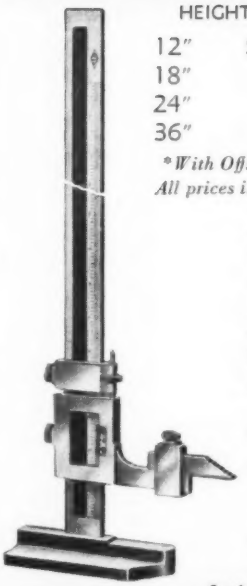

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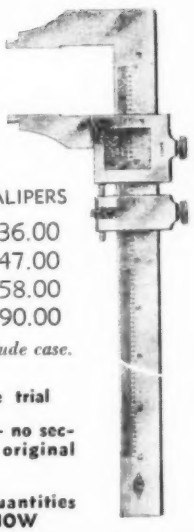

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through the hole in the truss rod and threaded into the forging.

With stud welding, the forging, the machining, and the hand welding are all eliminated.

Single gun Nelson production units with accurate locating fixtures are used to end weld the studs for all three applications. Once the cycle is started, by pushbutton or foot switch, the gun moves automatically into position, welds the stud, and retracts. In each case, a chute for carrying away broken ferrules is attached to the operator's work table.

In addition to the applications described, stud welding is also used on seat slides for all Nash, Rambler and Hudson cars.

Fig. 5. The rear axle tube is machined and a second stud is welded. This is used to hold a bracket which secures the sway bar at the axle end. To perform the stud welding the tube is located on a large pin which enters the bore on the flanged end, while the other end rests on a V-block. A pin enters one of the hub mounting holes for radial location. The welding operation is automatic, with an air cylinder automatically clamping the tube in place. A chute carries away broken ferrules.

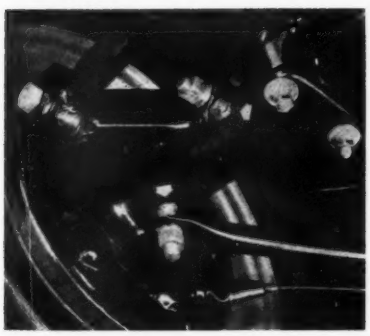

Fig. 6. The two end welded shoulder studs in the center of this picture perform vital fastening duties on the rear axle tubes of Nash and Hudson cars. The lower stud is a truss rod anchor and the stud at top center holds a bracket, also bolted to the flange of the tube, which secures the sway bar.

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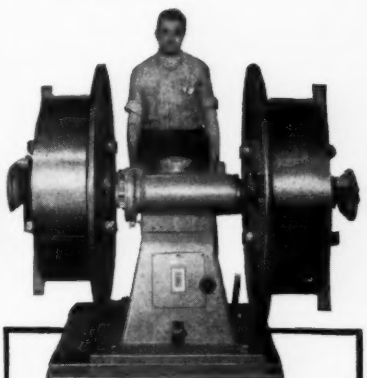

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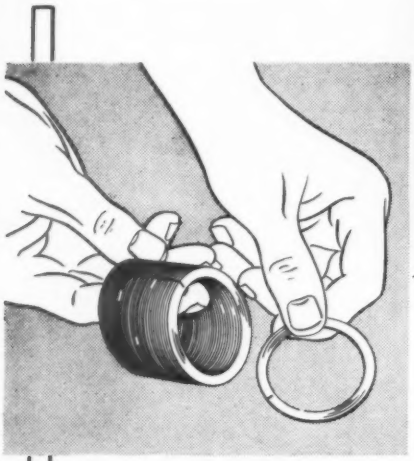

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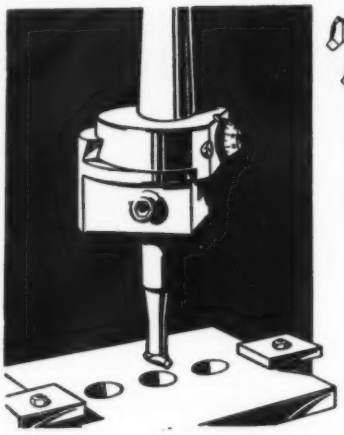

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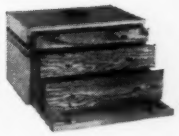

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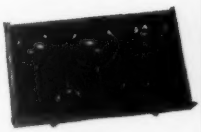

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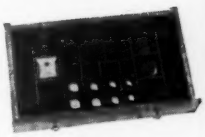

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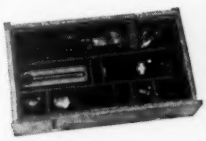

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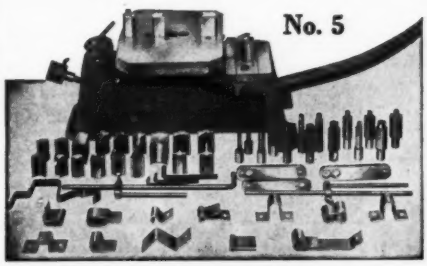

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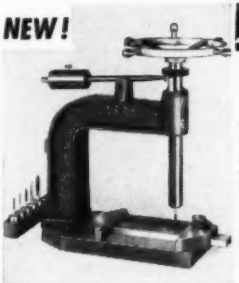

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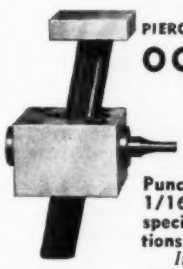

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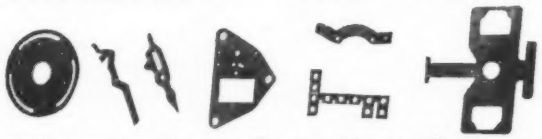

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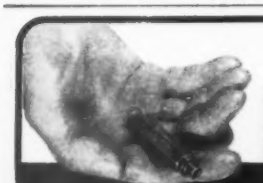

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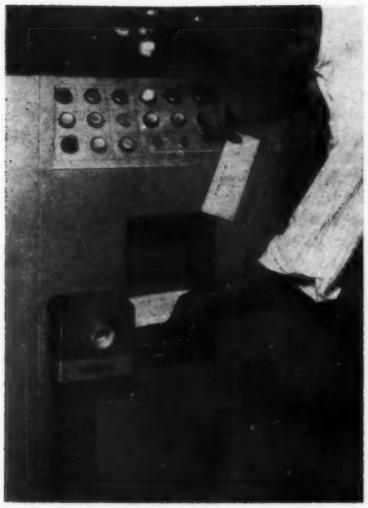

Fig. 2. Operator loads director of the Numerical Positioning Control. A separate business machine card is used for each punched hole.

reader, contains complete information for at least one machining operation. Three motions are automatically controlled in a typical operation. However, additional machining motions may be performed as desired.

To provide positioning control, the machine director angularly positions the rotors of the command selsyns in accordance with the punched card information. Each command selsyn is electrically tied to a position-sensing selsyn which is geared directly to a controlled machine member. The rotor voltage of the command selsyns is proportional to the angular positioning error between the two electrically-tied selsyns. Thus, correct positioning is accomplished by moving the machine member until this positioning error is zero. As soon as all members have reached the correct position, the machining operation is performed. This cycle continues until all operations are completed.

The extreme flexibility of Numerical Positional Control allows speed, accuracy and length of motion to

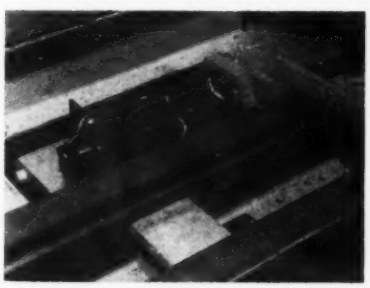

Fig. 3. Shown here is a selsyn pickup unit in the Numerical Positioning Control installation on an 80-ton turret type punch press. The pickup unit is used for automatic measurement of the table position.

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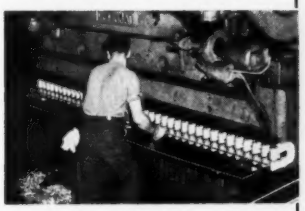

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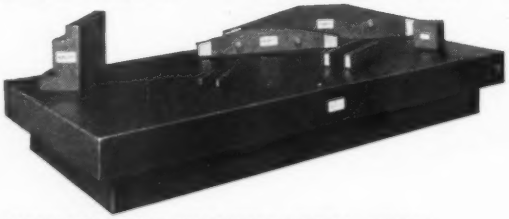

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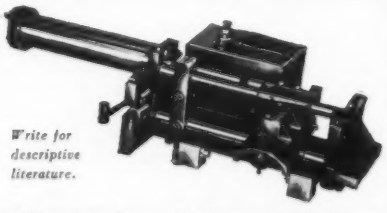

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Fig. 4. Operator presses button on director of the Numerical Positioning Control to set punch press into operation.

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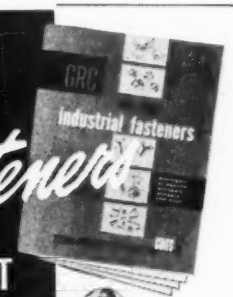

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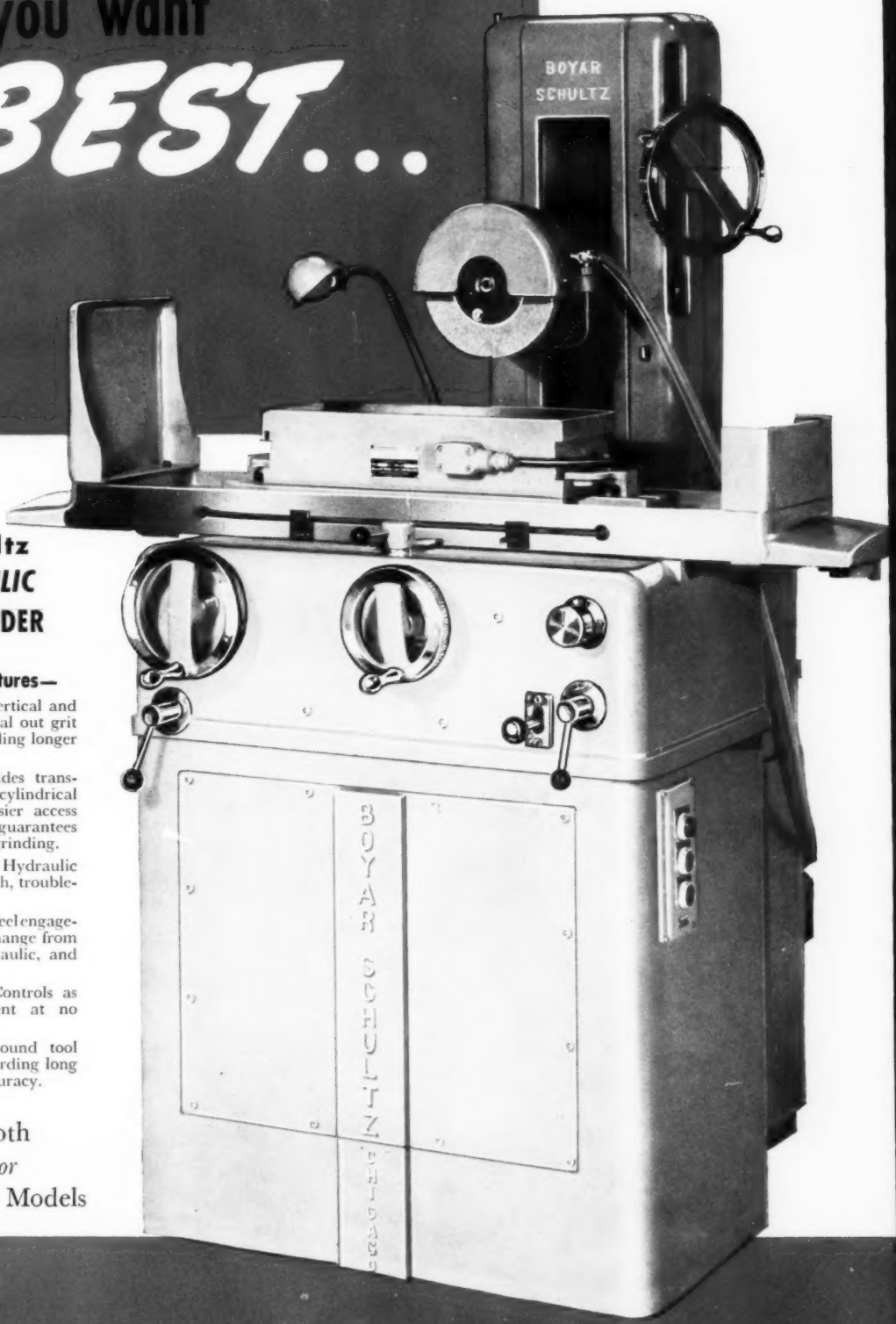

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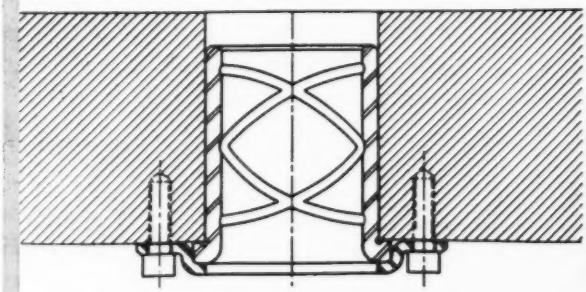
Like all other Lamina Guide Bushings, these heavy duty bushings are assembled with a wring fit in the shoe. Lamina Ring Clamp Bushings also are prefinished by precision honing at our plant. This not only eliminates distortion but saves considerable assembly time, effort and handling of large, heavy shoes.

AVAILABLE IN TWO MATERIALS

Lamina Ring Clamp Guide Bushings are available in both solid Ampco bronze and in hardened steel with bronze plated on the I.D. This latter bushing offers the ideal combination of long wear characteristic of hardened steel and the free-running action of bronze.



★ *In assembly, any portion of the clamping ring may be cut away for clearance if necessary as long as two opposite holes remain for clamping screws.*

★ *A variety of lengths is available in each diameter and each material.*

★ *Rounds out the complete line of Lamina precision guide bushings and pins which are available for every type of die application.*

Lamina®

DIES AND TOOLS, INC.

P.O. BOX 31, ROYAL OAK, MICHIGAN